Madras Fisheries Department

ADMINISTRATION REPORT

FOR THE YEAR 1936–37

BY

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Ref. No. 1650-G/37-11.

Station, MADRAS. *Dated the* 1st *November* 1937.

From

DIWAN BAHADUR DR. B. SUNDARA RAJ, M.A., PH.D.,
Director of Fisheries,
Madras.

To

THE SECRETARY TO THE GOVERNMENT OF MADRAS,
DEVELOPMENT DEPARTMENT.

SIR,

I have the honour to submit the Administration Report of the Fisheries Department for the year ending 30th June 1937.

INTRODUCTION.

2. I was on leave out of India from 23rd March 1937 to 1st October 1937 and Dr. F. H. Gravely, Superintendent, Government Museum, Madras, was appointed temporary Director during my absence. Certain items of research for which I was personally responsible could not be proceeded with during my absence, nevertheless there has been distinct progress in several directions.

3. In the two preceding years I had called the attention of Government to the Census Report of 1931 and to the Report of the Public Health Commissioner of the Government of India for 1933, both of which made pointed reference to the growing shortage of food supply in the country and the urgent need to develop sources of food other than Agriculture. But a more direct appeal urging Government to develop Madras fisheries has been made by "Nature,"* a scientific journal of the highest standing. No more

* "Nature," Vol. 140, No. 3537, dated 14th August 1937, page 270.

forcible argument than the facts which the paper brings forward is needed to convince one of the critical position in which the Indian fishing industry will soon find itself. A large firm owning 40 Japanese trawlers has commenced fishing operations on the Indian Coast and is landing hundreds of tons of fish into the Calcutta Market. The consequences to the Indian fishing industry, particularly that of Madras, the journal emphatically points out, will be disastrous. The fullest exploitation of the natural resources of the country for the benefit of the people is the avowed aim of the present autonomous provincial Governments. The menace of foreign exploitation in the wake of the Trawler's survey of the fishing grounds of the East Coast of the Presidency already foreshadowed in my reports for the years 1931–32 (paragraphs 4 and 16) and 1935–36 (paragraph 3) has assumed startling proportions. Not only is a depletion through overfishing likely to result, as in the Pacific and more recently in the shell fisheries of the Andamans and the Nicobar Islands, which "Nature" says will take many years to recover from overfishing by Japanese vessels, but the chief market for Indian fish products, which hitherto has been Japan, will automatically cease, spelling ruin to the local fishermen, the industry and the country at large. The time, it would seem, was never more opportune for a bold policy of fishery development in Madras. But it is surprising that the proposal for seriously curtailing the activities of the department has been revived for the eighth time within fifteen years. This demand for drastic retrenchment, it will be seen, is all the more unreasonable as the average surplus revenue of the Department has definitely increased since last year from Rs. 13,403 * to Rs. 15,944. Even in advanced countries expenditure on Fisheries is a recognized debit on public revenues, while this Department more than meets such expenditure and is not a burden on the tax-payer. A wide awakening to the need for fishery development in India has led to the resuscitation of the Fisheries Departments in Bengal and Baroda, who have each applied for Fisheries officers trained in this Presidency for organising their departments on the model of Madras.

4. For the third time the attempt to improve the catches and methods of the sea-going fishermen had to be unexpectedly terminated as the Master Fisherman recruited to demonstrate the possibilities of the Yorkshire "Coble" developed mental abnormalities almost immediately on arrival in India and had to be repatriated.

5. The salient features of the Biological research carried out during the year are—

(i) the discovery for the first time of the breeding grounds, eggs, and larvæ of the Indian mackerel, the second most economically important fish of the West Coast of the Presidency;

* Administration Report of the Madras Fisheries Department for 1935–36, paragraph 2.

(ii) the determination of the breeding season of the Carp (*Labeo fimbriata*), the most important fish of the Mopad reservoir;

(iii) the breeding of *Gourami* after years of experimentation at Mopad. Prior to this Gourami did not breed in either of the farms in the Nellore district and the introduction of the fish to Nellore waters had therefore presented serious difficulties;

(iv) the hatching for the first time of Hilsa eggs at Bobberlanka Hilsa Hatchery on the Godavari. Conclusive evidence of the actual rate of growth inferred from length frequencies of fish caught in the Godavari has been obtained.

Hilsa fingerlings occur not only in rivers frequented by the fish but also in tanks and ponds connected with the rivers in which they breed. A growth of 16·3 cm. to 22·5 cm. has been recorded in a tank which received its supply from the river in floods in August and dried up in April, confirming previous conclusions regarding rate of growth;

(v) the few oysters forming the nucleus of the stock of the Pearl Oyster park at Krusadai have continued to prosper and multiply. Pearl farming operations have now entered the second stage, that of providing a pearl farm on a commercial scale to exploit possibilities of inducing pearls in the Indian oyster and of providing spat for the rehabilitation of adjoining natural beds in barren years.

6. Due to my absence on long leave technological research at Tanur had to be suspended except for routine work :—

(i) The log out of a catamaran at Rayapuram treated by the "Ascu" process in 1933 and kept under observation continues to be sound and has long outlived its sister logs. This augurs well for the contemplated economies in capital expenditure on fishing craft by wood preservation methods.

(ii) The bamboo thorn fence similarly treated in 1935 is still in a good state of preservation in the Tanur North fish-curing yard while the rest of the fence with untreated bamboo has perished long ago.

(iii) The vitamin survey of South Indian fish oils has been continued with the assistance of the Director of Nutritional Research, Coonoor. Of the oils tested this year the oil of a man-eating shark and a skate (*Trygon* sp.) have proved to be most potent. Enquiries for supplies of shark oil have been received from medical men and institutions.

7. Following the systematic effort to effect economies in running fish-curing yards ever since they were transferred to the Fisheries Department, which have been so far successful that the fish-curing yards have ceased to be a burden on general revenues, a preliminary

inspection of swamps on the West Coast was conducted for the purpose of selecting the most favourable site for an experiment in the manufacture of salt. Should it prove possible to manufacture white salt locally on the West Coast, the entire transport charges by sea and rail which amounted last year to Rs. 72,336 could be saved for the fish-curing yards.

8. The fishing season was on the whole favourable, though a marked decline from last year's record was noticeable on both the coasts. On the West Coast, both oil sardine and mackerel were available in moderate quantities, the catches of mackerel being distinctly less than those of last year. On the East Coast, the most abundant fisheries were ribbon fish in the extreme south, where they have been scarce during the last few years, and white bait throughout the east coast from Ramnad to Vizagapatam. The fish-curing yards showed a surplus revenue of Rs. 48,048 against Rs. 97,153 last year.

PART I.

ACTIVITIES OF THE DEPARTMENT.

I. MARINE FISHERIES.

A. RESEARCH.

(a) Scientific Research.

9. (i) West Hill Biological Station, Calicut—*Plankton Investigation.*—Surface plankton was collected on 137 days during the year as against 145 days last year. Of these 102 hauls were taken off West Hill in inshore water (4 to 6 fathoms depth), five hauls off Chaliyam in depths ranging from 5 to 8 fathoms, 21 hauls off Tanur in offshore waters (10 to 16 fathoms) and four hauls off Calicut in depths ranging from 10 to 17 fathoms. The plankton was studied with special reference to fish eggs and larvæ, which were isolated for detailed study. For the first time this season it was possible to obtain eggs and larvæ of mackerel from the plankton collected in June 1937 off Chaliyam.

10. The quantitative study of plankton was continued on the usual lines. The plankton was at its maximum in August and its minimum in October. Last year the maximum was in April and the minimum in November and January. The bulk of the plankton consisted of copepods as usual which were present throughout the year.

11. *Phyto-plankton.*—The most abundant forms were *Coscinodiscus* represented by the species *C. gigas var diaramma*, *C. jonesianus*, *C. oculus-iridis*, *C. joneschii*, and *C. radiatus* and *Fragilaria spp.*

12. The table below gives the dominant groups of diatoms and their seasonal occurrence :—

Genus.	Occurrence.
Coscinodiscus	Abundant in August, September, November and February and in fewer numbers during the rest of the year.
Fragilaria	Abundant during October, less abundant in August, September, November and March and in small numbers during the rest of the year.
Chætoceras	Common throughout the year except October.
Biddulphia	Common throughout the year except December, April and June.
Trichodesmium	Abundant during March and April and absent during rest of the year.
Pleurosigma	Fairly common from August to December.
Rhizosolenia	Fairly common during August and from January to May.

13. *Zoo-plankton.*—As usual Zoo-plankton was more abundant than phyto-plankton. Copepods consisting of the species *Acartia erythræ*, *A. centrura*, *A. spinicauda*, *Paracalanus sp.*, *Euterpina sp.*, *Oithona plumifera*, *O. sp.*, *Temora turbinata*, *Pseudodiaptormus sp.*, *Acrocalanus sp.*, *Centropagus sp.*, were most abundant.

14. The seasonal abundance of the dominant animal organisms is given in the table below :—

Genus.	Occurrence.
Copepods	Abundant in December, January to March and May. Less so in October, November and February. Common during the remaining months.
Noctiluca	Abundant during September and June, common during August and March and scarce in October, November, February, April and May.
Evadne	Throughout the year. More abundant than last year. Common from August to September.
Larval bivalves	Throughout the year. Dominant from October to November and in April.
Daphnids	Fairly abundant from January to April and rare in October and November.
Sagitta	Abundant in April and May, and in fair numbers from September to March.

Genus.	Occurrence.
Appendicularia	In fair numbers from August to March.
Radiolarian (Acanthometron sp.)	Fairly common from September to December.
Phæocystis	In fair numbers in October and rare in February and March.

Fish eggs and larvæ were common in October and November and rare during the remaining months except August.

15. *Sardine investigation.*—Oil-sardine were scarce in Calicut and their eggs were not found in the plankton. Random samples of oil-sardine were procured whenever available locally and from Quilandy, Puthiappa, Beypore and Tanur for study.

16. Oil-sardine with well developed gonads appeared off West Hill in the second week of July 1936 and off Tanur in the last week of the same month, but spawning specimens with transparent ova were not available. In the last week of August, partly spent fish began to be caught off Quilandy and West Hill, and towards the end of September completely spent sardine occurred in the same localities in inshore water (2 to 3 fathoms). Evidently the spawning in 1936 commenced in August, i.e., earlier than in 1935. The spawning season this year (1937) commenced even earlier. In the last week of May 1937 catches of adult oil-sardine off Chaliyam were reported. On 11th June 1937 stray specimens of oil-sardine were found off West Hill in catches of another species of sardine (*Sardinella brachysoma*). On 12th June 1937 there was a large catch of oil-sardine off Quilandy. A sample of 50 specimens examined consisted entirely of fully ripe males and females; the ovaries were in an advanced stage of maturity just previous to the spawning stage. This confirms the observation on the breeding season of the oil-sardine by Messrs. Hornell and Ramaswami in 1922–23* according to which the breeding season may commence as early as May. Whether the spawning of the oil-sardine is continuous or discontinuous and whether there are two spawning seasons or a single protracted season beginning in May and ending in November are questions which require further investigation.

17. For the correct estimate of age, rate of growth, and the separation of different years' broods in the catches it is essential to collect both adult and immature fish occurring in the shoals for study, i.e., to sample the shoals correctly. The sardine nets used by the fishermen on the West Coast, however, have large mesh and capture only more or less adult fish, 12 centimeters and more. An important departure from the routine method of sampling sardine from the commercial catches made by fishermen was found necessary. A sardine net with small mesh was therefore employed by the department for collecting samples. Only 18 hauls were possible during the year with the net, which will be brought into systematic use next year.

* Madras Fisheries Bulletin No. XVII, page 163.

18. The size, sex, stomach contents, condition of gonads and fat of 3,141 specimens of oil-sardine were studied from the catches sampled during the year. The size frequency of the samples measured are shown below :—

Length overall.	July.	August.	September.	October.	November.	December.	January.	February,	March.	April.	May.	June.	Total.
4 cms. ..	..	..	1	..	..	..	..	..	..	..	..	..	1
5 ,, ..	..	..	34	..	..	..	..	..	..	..	..	..	34
6 ,, ..	..	..	15	..	..	..	..	..	..	..	..	..	15
7 ,, ..	..	..	4	..	..	1	..	..	..	..	..	..	5
8 ,, ..	..	..	6	..	..	18	..	..	..	..	..	..	24
9 ,, ..	..	..	58	8	..	48	..	..	..	..	..	..	114
10 ,, ..	..	..	72	87	2	31	..	..	..	..	..	..	192
11 ,, ..	..	7	12	120	66	17	17	..	..	..	..	..	239
12 ,, ..	..	224	2	78	207	75	161	15	..	..	..	..	762
13 ,, ..	..	360	..	9	101	54	124	23	..	..	..	..	671
14 ,, ..	..	20	9	2	11	6	12	2	..	..	..	..	62
15 ,, ..	..	..	56	62	4	3	..	..	..	1	..	6	132
16 ,, ..	..	..	8	137	66	29	1	..	..	20	..	71	332
17 ,, ..	..	..	..	16	64	18	..	..	..	16	..	66	160
18 , ..	8	11	..	1	7	6	..	..	..	..	..	40	73
19 ,, ..	14	60	22	24	13	10	..	..	..	1	..	7	151
20 ,, ..	13	29	27	42	17	16	..	..	..	2	..	8	154
21 ,, ..	5	1	3	3	2	2	..	..	..	..	..	1	17
22 ,, ..	1	..	..	1	..	1	..	..	..	..	..	..	3
Total ..	41	712	329	590	540	335	315	40	..	40	..	199	3,141

Though the size of fish in the catches ranged widely from 4 cms. to 22 cms. in length (overall), oil-sardine measuring 12 to 13 cms. were predominant in the catches. The size at which oil-sardine breeds seems to be 15 cms. Whether the capture of large numbers of immature fish before they have had a chance to spawn affects the fishery prejudicially is engaging the attention of the department.

19. *Food of the oil-sardine*.—The stomach contents of the oil-sardine were examined in detail as usual, and the following organisms were found :—

Copepods (*Euterpina*, *Paracalnus*, *Acartia spp.*, and *Oithona sp.*)
Peridinians : (*P. depressum*, *P. ovatum*, *P. occanicum* and *P. assymetricum*). Ceratium (*C. tripos*, *C. furca*, *C. massiliensi*, and *fusus*.)
Dinophysis. (*D. homunculus*, and *D. miles*).
Evadne sp.
Diplopsalis sp.
Larval bivalves.
Coscinodiscus : (*C. gigas var dioramma*, *C. Janesianus*, *C. radiatus*, *C. joneschii*, and *C. excentricus*.
Fragilaria sp.
Thalassiothrix nitzschodes.
Coscinosira sp.
Pleurosigma sp.
Biddulphia : (*B. granulata*, and *B. mobiliense*).
Nitzchia, *N. seriata*, and *N. Longismia*).
Chætoceras, (*C. curvisetum* and *C. lorenzianum*).
Ditylum.
Rhizosolenia setigera.
Asterionella Japonica, and
Bacteriastrum.

Fish eggs partly digested and similar to those of mackerel eggs were found in the stomach of an oil-sardine examined on 12th June 1937. This is the first occasion when fish eggs were found in the food of an oil-sardine.

20. *Scale readings.*—The scales of a few hundred specimens of oil-sardine were examined this year also and type scales mounted. The data are still insufficient for arriving at any definite conclusions.

21. *Races of oil-sardine.*—A preliminary report on the racial characteristics of specimens of *Sardinella longiceps* obtained from Karwar, Karachi, Muscat and other places outside the Presidency was prepared by the Assistant Biologist. A collection of specimens from Aden arrived towards the close of the year and is awaiting examination.

22. *Mackerel investigation.*—One thousand one hundred and seven specimens of mackerel were examined during the year for size, sex, stomach contents and the condition of their gonads and fat. As will be seen from the table below, they ranged from 11 to 25 cms. in length (overall), but the majority measured from 22 cms. to 23 cms., 22 cms. fish being dominant. Last year mackerel measuring 20 cms. and 21 cms. in length were dominant (vide page 9 of the Administration report for 1935–36).

Length overall.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
11 cms. ..	..	..	..	..	..	..	..	..	..	..	..	1	1
12 ,, ..	..	2	..	..	..	..	..	..	..	..	..	2	4
13 ,, ..	..	..	..	..	..	..	..	..	..	..	..	1	1
14 ,, ..	..	1	..	10	..	..	..	..	..	..	..	2	13
15 ,, ..	..	1	..	3	..	..	..	..	..	..	..	..	4
16 ,, ..	..	..	1	6	..	..	..	..	..	..	..	..	7
17 ,, ..	..	..	8	3	2	..	..	..	..	..	..	..	13
18 ,, ..	..	..	8	3	2	3	..	..	..	..	..	..	16
19 ,, ..	..	..	9	3	12	3	1	..	..	..	..	1	29
20 ,, ..	..	..	15	7	37	1	16	11	..	..	2	4	93
21 ,, ..	10	..	..	12	26	..	19	13	..	..	24	60	164
22 ,, ..	40	..	..	14	8	..	5	1	..	..	100	331	499
23 ,, ..	12	..	3	6	5	..	7	..	..	..	41	130	204
24 ,, ..	4	..	9	3	6	..	2	..	..	..	15	16	55
25 ,, ..	..	..	..	..	..	..	..	..	..	..	2	2	4
Total ..	66	4	53	70	98	7	50	25	..	..	184	550	1,107

23. The most important result of this year's research is the discovery by the Assistant Biologist of the eggs and the breeding ground of the mackerel off Chaliyam. Observation on the maturation of the gonads of the mackerel and the location of breeding grounds have been subjects of intensive study since 1934 (vide paragraph 22 of Administration Report for the year 1934–35).

24. The year 1936–37 was a good one for mackerel. The fishery began in the second week of July 1936. Adult fish with gonads in an advanced state of development appeared at the beginning of the season. Immature fish appeared in August and later the full-grown fish appeared only in the second week of September, but were all

spent ones having completed spawning. The maturation of the gonads was closely watched by examining samples every week. In May 1937 female mackerel with yellowish ovary filling more than half the body cavity were being caught. Towards the end of that month, the gonads reached almost their full development.

25. On the first of June 1937, twenty-five specimens caught off Chaliyam included spawning females with loose transparent ova. The average number of eggs in the Indian mackerel is nearly 94,000. Artificial fertilization of the eggs was unsuccessful. A field laboratory was set up at Beypore opposite to Chaliyam on the northern bank of the Beypore river. Some 471 specimens collected from the daily catches were examined till 10th June 1937, but no females in spawning condition similar to those collected on 1st June were available, nor were spent fish found in the catches. Night catches might have secured spawning females as the fish is known to spawn only in the early part of the night,* but owing to the outbreak of the south-west monsoon fishermen could not be induced to venture out to sea at night. This precluded further attempts at artificial fertilization.

26. Fortunately, however, the off-shore plankton obtained on 5th June, five miles off Chaliyam, at a spot where mackerel were being caught contained mackerel eggs of the size and characteristics of those extracted from the spawning fish examined on 1st June. Four hundred and five eggs were collected in different stages of development beginning with eggs just fertilized to those with larvæ ready to hatch out. There were also just hatched larvæ. The eggs which were undoubtedly mackerel eggs occurred in a spot where ripe mackerel shoaled and as the fertilized eggs closely resembled in size and character those obtained from a spawning mackerel it seems certain that the eggs in the plankton were those of the mackerel (*Rastrelliger kanagurta*). Dr. Delsman also identified mackerel eggs in the plankton in the Malaya Archipelago by a process of elimination and inference. In the absence of artificially fertilized eggs, the inference lacks that conclusiveness which was obtained for the eggs of oil-sardine in 1934 (vide paragraph 11 of Administration Report for the year 1934–35). This conclusive proof can only be furnished when spawning fish are secured and artificial fertilisation is carried out. According to Dr. Delsman the eggs are difficult to hatch in the laboratory. Fish in spawning condition were difficult to secure as the mackerel seems to spawn at night or breed beyond the reach of local fishermen. Another difficulty lies in the fact that its breeding season coincides with the South-West monsoon when fishermen are unable to go to sea. As no spent fish were found in the day catches, it may be inferred that mackerel either do not spawn in inshore waters frequented by local fishermen or after spawning at night leave the coast for the deep sea. Further research will no doubt elucidate these problems. The year's research, however, has

*Fish eggs and larvæ—9 *Scomber Kanagurta*—C.V.—H. C. Delsman Treubia, Vol. VIII, pt. 3-4, p. 395.

resulted in the discovery off the West Coast of the eggs and the early stages of the mackerel about whose identity there seems little doubt, and has further shown that mackerel breed close to the shore during the south-west monsoon.

27. The scales of mackerel are examined this year also and the observation made last year of the presence of a growth ring representing age confirmed.

28. *Other fishery investigations.*—In addition to the oil-sardine and mackerel, samples of other shoaling fishes of the coast such as *sardinella brachysoma, Leiognathus bindus, Cynoglossus semifasciatus, Kowala thoracata, Lactarius lactarius, Engraulis mystax,* and *Anodontostoma chacunda* were also examined whenever abundant. *Sardinella brachysoma* were found to breed early in June.

29. The usual collection and identification of the important food fishes of the coast continued and the data recorded in the fish register maintained for the purpose.

30. *Fish marking experiments.*—Five firms in America suggested by the Commissioner of the United States Bureau of Fisheries, Washington, were addressed for celluloid and metal tags suitable for marking oil-sardine. Among the replies received only one was found useful, but the manufacturing firm was not willing to number the tags, without which maximum use cannot be made of the experiment. My recent enquiries in Canada have enabled me to make the personal acquaintance of Biologists engaged in marking sardine in Vancouver who have promised to help in the experiments in Madras.

31. *Hydrographical and weather records.*—The usual daily records of surface temperature, specific gravity and hydrogen-ion concentration (pH) of sea water, of maximum and minimum temperatures of air, humidity, the condition of the sea, weather and sky were made. Salinities of water samples collected daily were also determined by chlorine titration. The surface temperature of the sea reached its maximum of 31·8°C. on 23rd April 1937 and its minimum of 23·7° C. on 6th August 1936. The salinity of sea water was highest on 16th April 1937 when it was 38·30 and lowest, namely, 18·08 on 7th August 1936. Its pH value ranged from 7·9 to 8·4 and specific gravity from 1·0200 to 1·0248.

32. *Visitors.*—The Honourable Minister for Development, Mr. M. C. Rajah, visited the station on 28th June 1937. Dr. S. G. Manavala Ramanujam, Professor of Zoology, Presidency College, Madras, with a party of Honours students worked at the station from 14th September to 16th September 1936.

33. (ii) KRUSADAI BIOLOGICAL STATION—*Plankton investigation.*—Inshore plankton was collected from the Kundugal channel on 110 days. The motor launch " Pearl " having been assigned to the station the collection of off-shore plankton became possible this year. Six collections were made during February and March this

year. Owing to strong currents the net was torn. The question of installing winches for working the Knudsen Net is being examined. The off-shore plankton appears to be far richer in zooplankton.

34. *Phyto-plankton.*—In the inshore plankton, plant organisms were fairly common during July, August, October, February, March and June and rare during other months. The largest quantities were obtained in November and June. Among the diatoms, occurring throughout the year, *Trichodesmium*, *Rhizosolenia*, *Chætoceras*, *Coscinodiscus*, *Thalassiothrix* and *Biddulphia* were dominant. The months when they abounded are given below :—

Trichodesmium	Most abundant in July, August, October and March.
Rhizosolenia	July, August, February to April.
Chætoceras	July, October and June.
Coscinodiscus ..	August, October, February and June.
Thalassiothrix	November and June.
Biddulphia	August and March.

35. *Zoo-plankton.*—Among animal organisms the following were the most important :—

Genus.	Occurrence.
Radiolarians	Common in February, March and June.
Hydromedusæ	Common in July and rare during other months.
Copepods and crustacean larvæ.	Throughout the year, but plenty in August, October, December and from January to March.
Leucifer	Fairly common in January and March.
Larval gastropods and Bivalves.	All round the year, but plenty from August to October and December.
Pteropoda	Common in March, rare in January, February, April, November and December.
Sagitta	Common in July and August and rare during other months.

36. *Identification of South Indian diatoms.*—The plankton collections from the West Hill and Krusadai Island Biological stations sent to Professor W. E. Allan of California for identification (vide paragraph 36 of the last year's report) could not be dealt with in full by him, for want of time for their study on account of a re-organization of the Zoology Department of the Scripps Institution of Oceanography, California. He was, however, able to make a hurried examination of the materials, and has furnished a tentative list of the dominant diatoms which will be useful for work in the two Biological stations. He has also noted two fresh water diatoms in the Krusadai collections, namely, *Oscillatoria irrigua* and *Bacillaria paradoxa*, not hitherto known to occur in the sea. His suggestions for further research on the plankton of the island are valuable and will be adopted when facilities for such work are available.

37. *Research on East Coast food fishes.*—The collection and study of the common food fishes was continued as usual. Thirty species of fish were collected and identified during the year. An uncommon cat fish, *Batrachocephalus mino*, not previously recorded, was obtained.

38. Biometrical and Statistical studies on the shoaling fishes of the Pamban area were continued on the usual lines. The fishes studied were—

1	"Thondan" (*Dussumieria hasseltii*)	500
2	"Choodah" (*Sardinella gibbosa*)	100
3	"Kuthippu" (*Lactarius lactarius*)	200
		800

39. *Hydrographical and Meteorological data.*—Maximum and minimum temperature of the atmosphere, humidity of air, direction of wind, rainfall, as well as the surface temperature, specific gravity and pH value of the sea water were recorded daily. Samples of sea water were titrated for the estimation of salinity thrice a week in the laboratory itself by the Research Assistant. The anemometer and the barometer acquired for the station require to be installed.

40. In the Kundugal channel the maximum surface temperature (30·4° C.) was recorded on 28th April 1937 and the minimum temperature (24·3° C.) on 9th January 1937. The salinity of the sea water was highest (38·66) on 10th July 1936, and lowest (24·40) on 18th December 1936. The pH value ranged from 8·3 to 8·8 during the year and the specific gravity from 1·0171 to 1·0256.

41. *Aquarium studics.*—It was not possible to revive aquarium experiments and studies at the station as the wind mill for pumping water recently purchased has not yet been installed.

42. *Research on Pearl Fisheries.*—Research during the last nine years (1928–1937) at the Krusadai Biological station has established the practicability of maintaining the Indian Pearl Oyster in parks and of breeding and growing the spat to adult size. This was one of the primary objects with which the station was started. This initial aim having been attained, the two objects of the station, viz., (1) enlarging the stock of oysters in the park so as to provide spat for re-populating the adjoining pearl banks when the natural supply fails and (2) inducing cultural pearls in the Indian pearl oyster for commercial purposes as in Japan, remain to be undertaken at the station. My studies in Canada of the methods adopted in establishing the Japanese edible oyster (O. *gigas*) in Vancouver and Seattle and my tour of inspection of the pearl fisheries in Japan will enable me to formulate the lines on which work should be continued to further the aims of the station.

43. The pearl oysters in the park have continued to thrive and breed. There were 425 pearl oysters in cages in the park at the commencement of the year. Thirteen live oysters obtained during

(1937) inspection of the pearl banks off Tuticorin were added to the collection. The number of casualties during the year was 124 and the percentage of mortality 29 as against 20 in the previous year. The increase in casualty is attributable to the bad weather that was experienced on many days.

44. The spat bred in the park is continuing to be kept under observation for age and rate of growth estimation. At the end of the year there were 63 oysterlings, and 45 spat collected during the year were placed in separate cages.

45. *Spat collectors.*—The spat which settle in the cages are gathered for augmenting the collections. To increase the collection of spat in the park, the Assistant Biologist has devised spat collectors made of bamboo thatties, 6′ × 6′ suspended in the park by means of floats and anchors.

46. Since many of the oysters in the park are of adult size their growth has become almost imperceptible, but a few are showing increase in weight. Of the five oysters that survived the experiment in Galaxea reef (vide paragraph 37 of the Administration Report for the year 1933–34) three oysters are still alive which shows that the park provides congenial conditions for rearing pearl oysters.

47. *Extension of pearl oyster park.*—The spot selected between Krusadai Island and Shingle Island, just beyond the coral reef, for the extension of the park to deeper waters, was found to be unsuitable for a park owing to high swells and strong tidal currents that are prevalent almost throughout the year. Further the bottom of the sea there is subject to incessant changes due to sand drifts. The depth originally was between 18 to 19 feet but after a couple of months was found to be only 13 to 14 feet. The oysters are already in a depth of 13 to 14 feet. Now that the motor boat "Pearl" has been transferred to Krusadai, it may be possible to choose a deep water site suitable for the park.

48. *Abnormal growth and melanism.*—No abnormal or rapid growth was noticed among the oysterlings during the year under report. Melanism was noticed this year also, but the blackness faded and became yellowish in some cases as the oysterlings grew. Some oysterlings continue to be thin and without finger like growths on the margin of the shells.

49. *Age and rate of growth of the Indian Pearl Oyster.*—A statistical analysis of the records of weight and measurements of pearl oyster under observation in the park at the Krusadai Island since 1933 was commenced this year by the Assistant Biologist with the help of Mr. Sundara Rama Sastri, the Statistician of the Madras University. No satisfactory method of estimating the age and rate of growth of the Indian pearl oyster has yet been agreed upon by workers in the field (vide paragraph 39 of the administration report for the year 1933–34). For the first time marked oysterlings and spat bred in the cages, whose age is known, have been kept under direct observation in the pearl oyster park. Some of them have attained adult size. The measurements and weights of

these oysters ascertained at regular intervals during the last four years when carefully analysed will, it is hoped, settle this vexed, question. A correct estimation of the age and rate of growth of the Indian pearl oyster is of vital importance for the scientific development and administration of pearl fisheries.

50. *Fauna and flora of the pearl banks.*—With the appointment of a technically qualified officer as Assistant Director, Pearl and Chank Fisheries, during the year, the collection and the identification of the fauna and flora of the pearl banks has commenced. The collection when completed will be sent to specialists for identification wherever necessary.

51. *Plankton of the pearl banks.*—The examination of plankton collected on the pearl banks during breeding seasons will show *inter alia*, favourable and unfavourable seasons by the abundance or scarcity of the oyster larvæ. The exact characters by which pearl oyster larvæ can be distinguished from the larvæ of other similar molluscs should first be determined by artificial fertilisation and hatching of oyster eggs in the Krusadai laboratory.

52. For the first time plankton collections were made over the chief pearl banks and examined under the microscope. The constituents of the hauls made are noted below :—

Tondi Banks . (Pasipatnam beds) 4¾ to 5 fathoms. 16th April 1937.

Phyto-plankton dominant.
Trichodesmium erythræm—plenty.
Phæocystis and *Chætoceras sp.*—common.
Sagitta, Ceratium massilience, Copepods and *Navicula*—few.
Oikopleura, Pleurosigma, Rhizosolenia slata and *Cartatium furca*—rare.

Rameswaram banks : 5 to 6½ fathoms. 23rd March 1937.

Dinoflagellets, Trichodesmium and *Chæteceras*—dominant.
Ceratium massilience—plenty.
Trichodesmium and *Evadne*—common.
Oikopleura, and *Ceratium monoceras, Palmeria*, and Larval bivalves—few.
Rhizosolenia stylifora with *Rechelis, Coscinodiscus Janeschii*, Daphnid (*Panilia orientalis*), *Pteropod* and *Sketletonima.* } Rare.
Copepods—*Avartia sp., Temore, Paracalanus sp., Eucalanus sp., Carycæus sp.*: few.

53. *Research on chank fisheries.*—The visits were made to the chank fishery centres in the Ramnad district, viz. Rameswaram, Devipatnam, Irumani, and Tirupalagudi. The total number of shells examined was 525 against 477 last year. Diameter and length measurements of the chanks were taken and the size composition worked out and recorded on vertical and diametrical measurements.

54. The chank shells of maximum length were found in Rameswaram this year. The greatest length recorded was 170 mm. Shells of maximum width were found only among the 'patti' shells of Tirupalagudi, the maximum diameter measured being 88

mm. The diameter of the Rameswaram shells never exceeded 81 mm. Eighty-nine per cent of the shells examined ranged in diameter from 51 to 70 mm.

55. The prices paid by the Ramnad lessee were one anna per shell for the 'Patti' shells of Devipatnam, and Tirupalagudi, against nine pies paid last year. One and a quarter anna each was paid for the 'Irupuravi' shells of Irumani against one anna last year, and one and a half anna each for the 'Jadhi' shells of Rameswaram and Thangachimadam as last year.

56. *Museum.*—The following crabs and worms collected at Krusadai Island and identified by Dr. Gravely were added to the collection :—

(1) *Upogebia sp.* (Leach).
(2) *Liolophus planiesimus* (Herbst).
(3) *Harmothoe ampullifera* (Grube).

57. *Colour preservation experiments.*—Two coloured fish specimens (*Holocentrus rubrum*) and (*Glyphidodon bengalensis*) preserved in the special colour preserving fluid on 31st August 1935 still retain their colour.

58. *Miscellaneous.*—As usual biological specimens of scientific interest were supplied to the Ennur Biological station. Samples of commercial trepang and all available molluscan shells also were collected for supply to the Vice-Consul of the Republic of China at Bombay. Ten green turtles (*Cholonia mydas*) were sold to the Madras Club during the year.

59. *Coconut and casuarina plantation.*—The coconut trees are all thriving. The lease of the above trees was given to one Dr. Venugopala Nayudu for a rental of Rs. 310 per annum as against Rs. 120 per annum of the previous lease for a period of three years. The casuarina plantation was extended by planting five thousand additional seedlings in December 1936. The banyan trees planted last year are thriving.

60. *Fish lease.*—The right of using the shores of Krusadai Island for catching fish was leased for three years at Rs. 27 per year to Mr. A. K. S. Aboo Bucker Marakayar of Mandapam.

61. *Conference of Fishery Officers of Ceylon and India.*—The annual conference of the officers of the Ceylon and Madras Fisheries departments arranged to be held alternatively in Ceylon and India was held this year in Madras in February 1937 in the office of the Director of Fisheries, Madras. The first conference was held in Ceylon in 1930. Since then no conference could be held until this year as the Ceylon officers were unable to come to Madras. The conference was attended by the Director of Fisheries, the Assistant Biologist, and the Assistant Directors of Fisheries (Inland) and (Pearl and Chank) representing the Madras Fisheries Department, and by the Marine Biologist and the Assistant Marine Biologist of

the Ceylon Fisheries department. The conference was held from 11th to 13th February when various subjects of immediate interest to the departments were discussed.

62. *Visitors.*—The following professors and parties of students visited the station :—

(1) Dr. K. S. Padmanabha Ayyar, Professor of Zoology, Science College, Trivandrum, with a party of thirteen men and five women students of the senior B.A. class from 31st August to 5th September 1936.

(2) Reverend Dr. R. Simpson, Principal, Lawrence Military School, Lovedale, the Nilgiris, with a party of nine European boys of the school from 10th to 18th September.

(3) Messrs. R. V. Seshaiya and N. P. Venkatasubhan, Lecturers in Zoology and Botany, respectively, of the Annamalai University with a party of twenty-six B.Sc. (Honours) students from 9th to 10th November.

(4) Dr. Y. Bharadwaj, Professor and Head of the Department of Botany and Mr. K. N. Gupta, Assistant Professor of Botany, of the Benares Hindu University from 18th to 22nd December.

(5) Dr. M. O. Parthasarathi Ayyangar, Director, University Botanical Laboratory, Madras, on 5th April 1937.

A sum of Rs. 59–12–0 was collected as fees against Rs. 71 last year. There were fewer visitors this year than last year probably due to the levy of fees ordered in G.O. Ms. No. 1406, Development, dated 12th October 1936. The levying of fees brings in very little revenue and is seriously reducing the value of Krusadai station as a training ground for zoological students. It was therefore recommended to Government that the fees should be abolished and subsidies should, if possible, be obtained from Universities for whom definite facilities should be provided.

63. (iii) VIZAGAPATAM LABORATORY.—The laboratory attendant sanctioned last year joined on 3rd July 1936 and was placed in charge of museum and stores. He helped the Inspector in the statistical work and in the collection of specimens. Arrangements for water-supply to the laboratory are still pending with the Public Works Department. Four more glazed wall cases were added to the museum. A model of a Masula boat was also purchased and added to the collection in the museum. The collection and identification of food fishes of the Circars and the compilation of information regarding their distribution, seasons, habits, etc., and the value and extent of the fisheries they yield was continued. At Uppada a specimen of the Gentriscid *Amphisile scutata* was secured, which seems to be new to the local fishermen.

64. (iv) MARINE AQUARIUM LABORATORY.—Twenty-eight samples of sea water collected at the Pulicat Oyster farm were titrated for the estimation of their chlorine content.

65. A sea-water aquarium was fitted up in the laboratory for the use of Mr. Job of the Zoological Research Laboratory of the Madras University for experiments on feeding habits of fishes. Mr. Rahimullah of the Osmania University, Hyderabad, was afforded facilities for his research on the anatomy of certain fishes.

66. Nine specimens of sea snakes were collected for Dr. Baini Charan Mahendra of St. John's College, Agra. Fish specimens were also supplied to—

(1) Capt. H. J. Hener of S.S. "Modasa";
(2) Mr. K. N. K. Nayar of Madras; and
(3) Dr. Joseph of the Paris Museum.

67. The special sea-weed manure prepared at the Aquarium referred to on page 62 of last year's report is still under observation and it has kept its quality without signs of deterioration for one and a half years.

68. Biological specimens such as fishes, snakes, and sea-urchins collected at the Aquarium were sent to the Research Assistant, Ennur, for sale.

69. (v) FISH STATISTICS.—Slow progress was made in the compilation of fish statistics at the West Hill Biological station due to the change in the laboratory attendant. The returns received from the fish-curing yards on the West Coast during the year were tabulated and monthly returns prepared and sent to the head office for scrutiny by the West Hill station. The statistics relating to the Kanarese yards in the South Kanara district were tabulated by the Laboratory Assistant, Ennur. The compilation of returns relating to the Telugu yards (Northern Circars and Central section) was done by the Inspector of Fisheries, Vizagapatam. A census of fishermen, gear and nets in the Northern Circars is being made by the Inspector of Fisheries, Vizagapatam.

(b) Technological Research.

70. (i) FISHING METHODS—*The Yorkshire 'Coble'*.—Mr. Ritchie, the Scottish fisherman selected by the High Commissioner for the post of Master Fisherman to work the 'Coble,' arrived in India on the 22nd October 1936, and joined duty on 26th October. The Government appointed him to the post of Master Fisherman with effect from 1st October, the date on which his services commenced according to the agreement executed by him with the Secretary of State for India (G.O. Ms. No. 2076, Development, dated 15th November 1936).

71. From the date of his arrival in India his manner was peculiar and his conduct abnormal. In November he visited Tuticorin to take charge of the Motor Coble, and Calicut for preparing the fishing gear. He returned to Tuticorin in December to inspect and select a winch when he broke down completely and had to be sent on 20th January 1937, to the General Hospital, Madras, by the local Sub-Collector and Port Officer. On examination by a Medical

Board, Mr. Ritchie was admitted into the Mental Hospital for treatment on 22nd January 1937. The Board found him unfit for work in tropical India and finally Government had to order his repatriation to England. He was accordingly sent to England under medical escort on 8th July 1937. It is to be hoped that the unfortunate breakdown of Mr. Ritchie will not be allowed to interfere with experiments in deep-sea fishing, especially as the Imperial Council of Agricultural Research have made the continuance of it a condition for their financing the scheme for fish manure research at Tanur. It is regrettable that for the third time schemes for the improvement of sea fishing methods have thus miscarried through no fault of the Department.

72. The danger of the Japanese exploitation of our sea fisheries to the detriment of local fishermen, the industry and the country at large, and the crying need for immediate efforts to develop the industry to fight unfair competition and exploit resources of the country for the benefit of its own people have been voiced by the press all over India.

73. As early as 1932 there was evidence * that the Japanese fished the Negapatam shark and lobster beds discovered by the trawler ' Lady Goschen ' in 1930, immediately after the publication of the discovery in the Administration Report of 1930–31.

74. In its issue of the 17th February 1936, the " Statesman " published an article stating—

> " Japanese trawlers are catching large quantities of fish in the Indian Ocean between Penang and Calcutta and are transhipping it at Singapore for transport to Japan. Previously the trawlers had been operating in the China Sea and off Australia, but their catches decreased owing to the operations of other trawlers in the same waters.
>
> In the Indian Ocean the Japanese ships, it is stated, are finding an abundance of fish and as much as 80 to 100 tons of fish are transhipped at Singapore for Japan. Most of this is for consumption there but a quantity is shipped back to Singapore as fish meal."

And again on 5th March 1937, the " Statesman " reported the appearance of a Japanese trawler, the " Shinkyo Maru " in the Kidderpore Docks, Calcutta, with a cargo of about 200 tons of fish. This report was followed by a third note, three days later, in the " Statesman " giving details of the Japanese plan of operations as follows :—

> " It was explained to a " Statesman " representative that this was a well-prepared and serious attempt to supply Calcutta with fish and that interested enquiries from many consumers had already been received.

* Annual Administration Report, 1931–32, page 16.

"It has been estimated that in Bengal 80 per cent of the population consume fish as a regular item of diet when they can afford to buy it; yet so badly is the industry organized and so hopelessly are the actual fishermen in the hands of *Mahajans* and middlemen that an ever-increasing demand goes unsatisfied while the price of such supplies as reach the Calcutta markets is maintained at a level which can only be described as exorbitant.

"The possibilities of establishing remunerative steam trawling in the Bay of Bengal have never been sufficiently explored, even though investigation had proved that there are extensive areas in the bay capable of yielding large quantities of high-class fish and which are suitable for trawling."

75. Considerable stir has been aroused by these reports and * several journals and papers such as "Current Science," "The Hindu" and lastly "Amrita Bazaar Patrika" have commented extensively on the need to develop Indian fisheries. Even "Nature," a London Scientific Journal of international repute has urged in a leaderette the need for Indian fishery development especially in Madras. Madras among the sea board provinces in India with its extensive coast line, valuable chank and pearl fisheries and cured fish, guano, fish oil and manure industries, employing about 1¾ lakhs of the coastal population stands to lose most, as pointed out by "Nature." Immediate steps for developing the sea fisheries are therefore called for and will engage the attention of the department during the ensuing year. The long leave out of India has enabled me to study conditions and methods of sea fishing in advanced western countries and modern Japan which should be of value in shaping future policies.

76. (ii) TANUR EXPERIMENTAL STATION—*Advanced research on fish manure, etc.*—Though the research scheme for improving the fishing industry and developing the supply of fish manure was approved by the governing body of the Imperial Council of Agricultural Research (vide paragraph 65 of the last year's report) the Council was not able to finance the scheme during the year (1936–37). In their letter No. 986-IV/36-11, dated 26th June 1937, the Madras Government have asked the Imperial Council when funds will be provided.

77. In September 1936, the Imperial Council asked for a detailed technical programme of work for the research chemist to be appointed at Tanur. Though a detailed programme for the chemist

* "Current Science," No. 11, Vol. V, pages 573–577—May 1937.
"Nature," Vol. 140, No. 3537, dated 14th August 1937, page 270.
"Statesman," Calcutta, dated 17th February 1936, 5th March 1937, 15th April 1937.
"Amrit Bazaar Patrika," dated 26th September 1937.
"Hindu," dated 14th September 1937.

could not be framed, a note stating in general terms what is required of him was sent to the Council. Roughly the programme of work for the chemist was to be—

(i) During the first six months in India he should study the local fish capable of yielding these products, the supply of raw materials, the current methods of manufacture of oil, meal and manure at Tanur, and in the private factories, the methods of storage and transport and connected problems that require to be solved;

(ii) in the next eighteen months he should visit Europe, America and Japan and study up-to-date methods and processes in the important centres of manufacture and specialize on the lines of research required to solve the problems relating to the industry in South India; and

(iii) on his return he should carry out research for two years at Tanur on all the problems connected with the industry and aim at their satisfactory solution.

78. The programme was considered by an *ad hoc* committee and the advisory board in January 1937. They have recommended that the research chemist should pay particular attention to the preparation and storage of fish meal, fish manure and fish oils and the preservation of fish for transportation to market. After six months' survey of local conditions, he should submit a scheme of work along these lines for the consideration of the Imperial Council of Agricultural Research. It was also agreed by the *ad hoc* committee that determination of the vitamin content of these materials was very necessary, but this should be carried out at the Coonoor or other Institute working on nutrition. The advisory board adopted the recommendations with the proviso that industrial problems should be excluded from the scope of the scheme.

79. One of the conditions under which the Imperial Council sanctioned the scheme was that the Madras Government should provide a suitable chemical laboratory. A tentative list of apparatus and chemicals required for a laboratory was drawn up in consultation with the Leather Research Chemist of the Industries department amounting to an estimated cost of Rs. 2,900 and Government were requested to allot funds in the year 1936–37. The Government were also asked to provide a sum of Rs. 2,000 under "Expenditure in England—Fisheries—Stores" in the first six months' budget for 1937–38 for the purchase of a small electric plant and a gas plant for the laboratory. Some of the required apparatus and chemicals have been purchased. The choice of the electric and gas plants is receiving the attention of the High Commissioner in London. A set of advanced books on the subject has also been ordered.

80. To house the laboratory it was decided to utilize the old school shed in the Tanur station, providing suitable fittings and alterations and an overhead tank. Plans and estimates for this work are under preparation.

81. *Experiments with sodium hypochlorite.*—The new electrolyser (vide paragraph 72 of the last year's report) was received at the station on 20th April 1937. This was sent to the Marine Aquarium, Madras, where the required *Naclo* will be produced and supplied to the Tanur station.

82. *Experiments with CO.*—Prawns are now stored only in carbon dioxide filled tins and the supply is now rendered possible throughout the year. The use of this agent for storing salt fish of all kinds remains to be tested. On 20th March 1937 twenty-five pounds of " podimeen " were cured and stored in two soldered kerosene tins, one filled with carbon dioxide and the other without carbon dioxide to serve as control. The fish were examined on 27th June 1937. There was not much ' rusting ' in evidence either in the tin packed with carbon dioxide or in the control. The tins have been resoldered and the one with carbon dioxide treated fish refilled with that gas for the continuance of the experiment.

83. *Experiments with prawn pickling.*—All the six kilner jars packed on 2nd, 3rd and 4th August 1936 were examined on 9th March 1937 without opening the jars. The prawns seem to be well preserved; the liquid is quite clear but the colour is not as pale as that of the English sample. This is perhaps due to the high temperature (120° C.) employed in processing and an acid pickle. One difference noticed is that the jar with 0·6 per cent acid is of a distinctly paler colour than the others with only 0·3 per cent acid.

84. Experiments have been conducted with the pickling media composed of varying proportions of vinegar and brine and with varying processing times and temperature. The resulting packs are under observation. To test the pH of the pickle in the bottles indicators, e.g., (1) Thymol blue, (2) Bromocresol green, (3) Bromocresol purple, (4) Bromothymol blue, (5) Phenol red and (6) Mythil red were supplied to the station by the Assistant Biologist in April 1937. The pH of the pickle is a highly important factor in the proper preservation of pickled prawns. The problem to be solved is to find the right composition of the mixture of vinegar and salt in the pickle which after processing and storage will have a pH value of seven or thereabouts. The Research Assistant, an honours graduate in Bio-Chemistry, has been asked to determine this by a series of experiments and tests.

85. *Experiments in pickling fish in brine for long storage.*—Two fish extensively cured on the West Coast (mackerel and " Chamban ") have been experimented on for testing the new pilchardizing process of keeping fish to be cured from one fishing season to another. The experiments continued from October 1935 to March 1937, a year and five months. The fish pickled were tested periodically and samples were sun dried and marketed from time to time. As all the fish were easily sold, the success of this process for long storage for the fish curer has been proved. Other kinds of fish cured on the West Coast will be subjected to experiment in the near future.

86. *Artificial drier.*—No successful experiment was done with the drier this year on account of my absence on long leave.

87. *Experiments with cemented vats and glazed pots.*—Glazed earthern ware jars which seem to be the only hygienic curing vessels which the poor curers on the East Coast can afford have been subjected to tests since 1932. The last jar of 16 gallons capacity supplied by the Standard Tile and Clay Works, Alwaye, in January 1936 has proved to be satisfactory. Filling with brine used in fish-curing and emptying in alternate weeks in the Tanur North Fish-curing yards has not affected the jar in any appreciable manner.

88. *Fumigation with carbon bi-sulphide.*—It was felt that treatment with this drug was too frequent, the quantity of drug used excessive and that the faint taint of drugs noticed in the fish in the first experiment (paragraph 86 of last year's report) might be due to these causes. This year the procedure was therefore changed. Fumigation is now done only once a month. Experiments were carried out on 16th January 1937 with two kinds of fish, "Podimeen" cured on 23rd November 1936 and mackerel cured on 16th January 1937. Both the fumigated fish are well preserved except for "rusting" due to the oxidation of fat. The control on the other hand emits a strong smell of putrefaction, is soft and pasty to the touch and shows moulds and pink eye.

89. The above experiments show that carbon bi-sulphide prevents putrefaction due to bacteria, moulds and pink eye, but does not arrest "rusting" due to oxidation of fat.

90. *Vitamin survey of fish oils.*—In paragraph 80 of last year's report it was stated that vitamin potency was found either deficient or absent in Tanur oils till 1933, due to defective methods of manufacture. The defect can only be remedied by the modernizing of the plant and process. It has been recognized that elements like iron, copper and manganese which can oscillate between two or more valency states act catalytically in the oxidation of vitamin A. As a preliminary to elaborate tests which have been planned, a simple modification was experimented with to see how far the oxidation of oil can be arrested. One of the copper boilers used in cooking the fish was tinned. On 18th and 24th November 1936 when sardine were available equal quantities of fish were cooked in the tinned and the untinned boiler and the oil was extracted under identical conditions. The skimmed oil from the boilers was tested at the Nutrition Research Laboratory at Coonoor for Vitamin and the oil from the tinned boiler showed a higher percentage of vitamin A. The loss of vitamin A is, however, still high even with the tinned boiler. High temperature and the atmospheric oxygen are apparently causing the destruction of vitamin A. Boiling the fish in closed vessels totally excluding oxygen and at lower temperatures by reducing atmospheric pressure is expected to improve the quality of the oil. Such tests will be possible when the laboratory is fully fitted up for the scheme sanctioned recently by the Imperial Council of Agricultural Research.

91. A sample of body oil from *Lates Calcarifer* (Mal.—" Narimeen ") supposed to be rich in vitamins was prepared and tested, but showed only traces of vitamin A. Oil from the body and liver separately will be prepared for vitamin assay this season.

92. Oils extracted from the following fishes of the Tinnevelly district by the Assistant Director, Pearl and Chank Fisheries according to Tanur methods were sent to the Director, Nutrition Research, Coonoor, for the estimation of vitamin A :—

Name of fish.	Scientific name.	Vitamin A (y) per gramme (Y = 001 mg.).
Ribbon fish	*Trichirus haumela* ..	nil.
" Kuthippu ".	*Lactrius lactarius* ..	a trace.
" Karuppu chalai " (Sardine).	*Sardinella sindensis* ..	a trace.
" Varipulayan sura " (shark).	....	4,200
Engraulis (" Thotta ").	*Pellona brachysoma* ..	Nil.
" Soman Thirukkai ".	*Trygon bleekeri* ..	about 400
" Panchal amai " (Turtle).	....	a small quantity.

Among the liver oils so far tested that of the man-eating shark " Varipulayan sura " has been reported to be ten times more potent than an average sample of medicinal cod-liver oil. It was found to contain 4,200 y. of vitamin A per gramme of oil. Turtle oil however was found to contain only a small quantity of vitamin A.

93. *Storage of oil.*—Defective storage causes a rapid destruction of vitamin A in sardine oil—vide tests 16 and 17 in paragraph 79 of last year's report. Suitable air tight non-metallic containers have not yet been secured for experiments.

94. *Experiments with an anti-oxident (maleic acid).*—Yet another method of arresting vitamin destruction in storage is the addition of minute quantities of anti-oxidents. 0·01 per cent of Maleic acid has been specially recommended for edible fish oils by the Biological Board of Canada. Experiments with Maleic acid were started on 9th May 1937. Acid value determination of the treated oil and control is being recorded once in three months.

95. *Research on sea-weed manure.*—Of the three dying coconut trees (vide paragraph 82 of last year's report) treated with sea-weed manure one died during the year and the remaining two were remanured on 15th May 1937.

96. The manure obtained by the composting experiments conducted at the Krusadai Biological station with the help of the Agricultural department were tried on garden plants and were found very efficacious.

97. The tests with different containers to determine the keeping qualities of the sea-weed manure started on 28th January 1936 were continued at the Aquarium. There seems to be no difference between

manure stored in a kilner jar, a gunny bag, and a tin and the quality of the manure has not been impaired after twenty months' storage. The proportion of shell, fish and weed composing the manure is apparently correct. Additional proportions of fish and shell will be tried in future experiments to ascertain the maximum proportions of these ingredients consistent with good keeping qualities of the manure.

98. (2) *Kelp and iodine.*—The ashes of the sea-weeds *Ulva reticulata* and *Enhalis acoroides* referred to in paragraph 84 (2) of last year's report were sent to Dr. J. R. Booer of London for iodine test. He did not find any measurable amount of iodine in either. None of the weeds so far tested seems to have sufficient iodine to warrant commercial exploitation. All available kinds of weeds will be tested before abandoning this research.

99. *Research to lengthen the life of fishing craft and tackle.*—One of the logs in a catamaran belonging to a fisherman at Rayapuram (Madras) which was given the "Ascu" treatment on 19th October 1933 was inspected during the year and found still to be in a satisfactory condition thus proving the success of the preservative process.

100. The fence put up at the Tanur North fish curing yard with treated bamboos and thorn in 1935 (vide paragraph 67 of last year's report) is continuing in good condition, while the control fence has deteriorated. The observation will be continued till the treated fence shows signs of deterioration. A proper treatment of the material under requisite pressure and an economical use of the chemicals as prescribed by the inventors of the process was not possible as the lid of the pressure cylinder leaked. Providing the cylinder with a hinged leak-proof lid is under correspondence with the manufacturers. The chemicals ordered for continuing the experiments have also not yet arrived.

101. (2) *Nets.*—Fresh experiments in the treatment of nets were not possible since the chemicals necessary for treatment ordered in September 1936 were received only in April 1937. The fishing season having closed it was decided to have a full set of experiments conducted during the coming season. The treated nets which have been hired out (vide paragraph 70 of last year's report) were examined in December 1936 with the following results :—

"Paithuvala", sections of which were treated in three dips B, C and D, with untreated portions as control showed that dip B damages cotton nets, as the portion treated by this dip was badly torn. The portions treated with dips C and D and the control are still in fair condition. According to a practical fisherman who was consulted the portions treated with dip D can be used for a second season whereas an ordinary "paithuvala" lasts only one season, viz., about nine months. The usefulness as well as the superiority of dip D for cotton nets is indicated by this experiment.

102. There were fifteen hemp drift nets for hire. Three were treated with dip B, three with dip C and three with dip D, and the remaining six were left untreated to serve as control. They were hired to a local fisherman who used them during the last fishing season. The three nets treated with dip B were sticky and could not be regularly used for fishing. Of the rest the three treated with dip C are in a better state of preservation than the rest, control included.

103. *Purchase and manufacture.*—Twelve thousand eight hundred and six pounds of fish costing Rs. 480–12–6 were purchased and cured this year against 16,668 lb. worth Rs. 458–3–3 in the previous year. Thirty-five thousand eight hundred and seventy-six pounds of fish costing Rs. 381–8–8 were purchased for fish meal operations against 9,818 pounds of fish costing Rs. 77–12–0 in the previous year.

104. The total output for the year was 2,636 lb. of cured fish, 8,306 lb. of fish meal, 1,151 lb. of pink meal, and 62 gallons of oil at a cost of Rs. 1,386–10–5 against 7,450 lb. of cured fish, 6,671½ lb. of fish meal, 2,061 lb. of pink meal, 2,120 lb. of fish bones and 1,624 lb. of fish cake at a cost of Rs. 969–3–7 last year.

105. *Sales.*—Two thousand four hundred and fifty-nine pounds of cured fish, 9,901½ lb. of fish meal, 4,730 lb. of guano, 321 gallons of fish oil and miscellaneous articles amounting to Rs. 4,423–12–7 were sold during the year against 2,810 lb. of cured fish, 8,980¾ lb. of fish meal, 9,634 lb. of guano and 186 gallons, 2 bottles of fish oil and miscellaneous articles amounting to Rs. 3,776–13–6 last year.

106. *Stock.*—The year closed with a stock of 130 lb. of prawns, 96 lb. of fish meal, 3,941 lb. of fish bones, 3,440 lb. of fish guano, and 626 gallons, three pints of fish oil against 24,270 pickled mackerels, 2,637½ lb. of fish meal, 950 lb. of pink meal, 2,650 lb. of fish bones, 7,672 lb. of guano and 887 gallons and one pint of fish oil in the previous year.

107. *Receipts and expenditure.*—The receipts for the year amounted to Rs. 4,839–3–4 against Rs. 3,297 last year. The expenditure excluding the establishment charges of Rs. 2,235–7–6 amounted to Rs. 4,521–6–1, against Rs. 3,905–15–4 in the previous year.

108. *Visitors.*—The professors and students of the Zoology department of the Presidency College, Madras, and the students of the Fisheries Training Institute, Calicut, visited the station during the year. The Hon'ble Mr. M. C. Rajah, the interim Minister for Development, also visited the station on 1st July 1937.

109. *Further retention of the station.*—The sanction accorded in G.O. Ms. No. 576, Development, dated 8th April 1936, for the continuance of the station expired on 31st March 1937. Since the Governing body of the Imperial Council of Agricultural Research has approved the scheme of research on fish-manure and oils submitted to it, the permanent retention of the station from 1st April 1937 was recommended to Government in my letter No. 3256-E,

dated 22nd October 1936, but Government sanctioned the station for a further period of one year from 1st April 1937—vide G.O. Ms. No. 2097, Development, dated 20th November 1936.

B. ADMINISTRATION.

(a) Public fish-curing Yards.

110. There were 99 fish-curing yards at the beginning of the year of which two were private yards (Malpe and Padu-Thonse). One of the temporarily closed yards, Kodumbi on the West Coast was re-opened during the year. There were thus 100 yards at the close of the year. Of these ten were in charge of Sub-Inspectors, 84 in charge of petty yard officers and the rest in charge of peons.

111. (i) EAST COAST (NORTHERN SECTION).—The number of yards in this section remained 26 as last year.

112. The proposal for the shifting of Calingapatnam yard to Bunderpet is still under consideration. The fishermen of Kothapalem village who applied for a yard were not able to meet the cost of the buildings without an advance from Government. They verbally agreed to provide the necessary security deposit against loss. They have been asked to give a written undertaking agreeing to abide by all the conditions imposed by Government for the opening of new yards. The fishermen of Nizampatam expect to raise the necessary deposit as security against loss in March 1938 when the proposal for opening a yard in that village will be further considered.

113. *Review of the chief coastal fisheries.*—Judging from the catches the six economically important fish of the Northern Circars during the year were " White Bait, " " Ribbon fish, " " Jew fish, " " Sardine, " " Cat fish, " and *Pellona* in the order of their importance by weight. " Silver Bellies " which were sixth last year are seventh this year as unusually large catches of *Pellona* occurred. According to value the six important fish are " White Bait ", " Ribbon fish ", " Jew fish ", " Sardine ", " Cat fish " and " Pomfret". Sardine occurred all the year round except in September and were abundant in November and June. Ribbon fish and Jew fish occurred all the year round, the Ribbon fish abounding in July and September. Jew fish were plentiful in July. White Bait occurred almost all along the coast from November to April.

114. *Transactions.*—The total quantity of fresh fish brought to the yards was 95,253 maunds 15 seers against 1,37,964 maunds 11 seers last year. The total quantity of salt issued was 12,937 maunds 13 seers against 18,242 maunds 30 seers last year. The total quantity of cured fish removed from the yards was 55,373 maunds 33 seers against 81,294 maunds 24 seers last year. Transactions were poor in all the yards except in Mukkam, Pudimadaka, Polavaram and Pentakota which showed an increase over last year's operations.

115. *Supply of salt.*—The total quantity of salt supplied to the yards during the year was 12,454 maunds against 18,320 maunds last year. Of this, 1,422 maunds were monopoly salt and 11,032 maunds Excise salt. The rate paid per maund of monopoly salt

ranged from five annas six pies to six annas six pies and of Excise salt from three annas to Re. 1–6–6. Compared with last year the price paid for monopoly salt was slightly higher and that for Excise salt much higher on account of a shortage of salt in the Circars.

116. *Wastage of salt.*—There was no wastage of salt during the year.

117. *Balance stock of salt.*—The stock of salt in the 26 yards at the beginning of the year was 1,771 maunds 19 seers and at the close of the year 1,288 maunds 6 seers.

118. *Reforms in yards.*—Ramayya, a ticket holder of Baruva, who was persuaded last year to cure some of his fish with white salt and compare results with fish cured with the ordinary brown salt conducted the experiment this year. The peon-in-charge of the yard reported that the fish cured with white salt was not readily saleable and fetched only Rs. 3 to Rs. 3–8–0 per maund against Rs. 3–4–0 to Rs. 4 obtained for the fish cured with brown salt. The experiment will be tried departmentally.

119. Girder frames for steel yards were installed with cement platforms in all but one of the remaining yards and a model store-shed with asbestos roofing was erected at Baruva during the year.

120. *Miscellaneous—Fence.*—The fence problem is still acute in many yards and the growing of screw pine, aloe and cathedral cactus is being steadily pushed.

121. (ii) EAST COAST (CENTRAL SECTION).—The number of yards in the section was nine as last year.

122. *Review of chief coastal fisheries.*—The chief shoaling fishes caught during the year were Pomfret, Ribbon fish, Mullet, Mackerel, Sardine and Prawn. Pomfrets were available in most of the yards on the sea-coast in the months of August, January and June. The catches of Ribbon fish and Mullet were not considerable. Mackerel were found only in three yards (Kadapakkam, Sathankuppam and Nilathurpalayam) in the months of July, September to November, and January and February. Except for two or three months Sardine was available throughout the year. Prawns were caught only in the two yards (Mangode and Irukkam) during the months of December, February, April and May.

123. *Transactions.*—The total quantity of fresh fish brought to the yards was 90,261 maunds 1 seer against 96,315 maunds 35 seers last year. The total quantity of salt consumed was 13,494 maunds 24 seers against 14,248 maunds 15 seers in the previous year. The quantity of cured fish removed was 50,820 maunds 24 seers against 54,051 maunds 32 seers last year. The fall in the transactions this year was mainly due to poor catches and failure of the fishing season during the first half of the year. The yards that had poor transactions were Kadapakkam, Nelathur, Kondurpalayam, Kothapatnam, Mangode, Sathankuppam and Medicalkuppam. There were improved operations in Irukkam and Pulianjerikuppam yards.

124. *Supply of salt.*—The total quantity of salt supplied was 13,230 maunds of which 4,800 were monopoly and the rest Excise salt against 14,890 maunds (7,770 maunds monopoly and the rest Excise) last year. The cost of monopoly salt was three annas ten pies per maund while that of Excise salt was three annas five pies on an average at Tada factory and three annas eight pies per maund at Voyalur factory as compared with three annas four pies and two annas two pies per maund respectively in the previous year.

125. *Wastage of salt.*—There was a wastage of four maunds of salt during the year for which the transport contractor was held responsible.

126. *Balance stock of salt.*—The stock of salt at the beginning of the year was 881 maunds 26 seers and at the close of the year 613 maunds 2 seers.

127. *Miscellaneous—Yard fence.*—Attempts to grow Korukapuli have failed on account of village cattle.

128. (iii) EAST COAST (SOUTHERN SECTION).—The number of yards continued to be fourteen.

129. The fishermen of Kuttankuli who asked for a yard in their village have not yet agreed to provide the security deposit in advance and to comply with the other conditions imposed by Government for opening new yards. As the sea has encroached up to the southern wall of the salt store shed at Point Calimere the store shed was shifted to the northern end of the present site and arrangements are being made to shift the yard further inland.

130. *Review of coastal fisheries—Tinnevelly district.*—The "Tondan" (*Dussumieria*) and the "Thiravanganai" (*Pellona*) fisheries were normal while the sardine and cat fish fisheries were poor. The "Savalai" (*Trichurus*) fishery which was poor at Idinthakarai for the last few years revived and good catches were made during the season. At Ovari and Pinnakayal the fishery was poor.

131. In the *Ramnad district* the fisheries at Mukkur were poor as a whole. At Attankarai also, the season was poor due to absence of shoals of Kalar (*Anodontostoma sp.*), "Nethili" (White bait) and Sardine. At Nambuthalai, however, "Cheppili" (*Lutjanus*) and "Parai" (*Caranx*) fisheries were successful.

132. In the *Tanjore district*, White bait were very abundant at Vanagiri and Tranquebar while other fisheries were normal. At Arcot Thurai the important Hilsa, Pomfret, Thread fin and Jew fish fisheries were poor. In Point Calimere, the Thread fin, Cock-up and Jew fish fisheries were favourable. In Muthupet, Adirampatnam and Sethubhavachatram yards in Palk Bay the Cat fish and the Shark fisheries were poor.

133. *Transactions.*—The total quantity of fresh fish brought to the yards was 58,228 maunds 24 seers against 69,932 maunds 29 seers in the previous year. The quantity of salt issued was 12,208 maunds 19 seers against 13,897 maunds 2 seers last year. The weight of cured fish removed from all the yards amounted to 40,732 maunds 5 seers against 48.139 maunds 28 seers last year. Excepting

at Idinthakarai in the Tinnevelly district, Nambuthalai in the Ramnad district, and Tranquebar, Arcot Thurai and Point Calimere in the Tanjore district, transactions in the yards were poorer than last year.

134. *Supply of salt.*—Twelve thousand five hundred and twenty-two maunds of salt against 11,846 maunds last year were supplied to the yards during the year. The price of salt per maund varied from one anna five pies to five annas against one anna four pies to six annas last year.

135. *Wastage of salt.*—There was a wastage of six maunds of salt in a consignment of 300 bags despatched in December 1936 from Tuticorin to Mukkur fish-curing yard in a boat. The wastage was due to eleven bags at the bottom of the boat becoming wet in an unexpected storm encountered on the way.

136. *Balance of salt.*—The stock of salt at the beginning of the year was 2,892 maunds 6 seers and at the close of the year 3,199 maunds 27 seers.

137. *Miscellaneous—Yard fence.*—The live fence is secure in most of the yards except at Muthupet where it is being washed away by floods in the river Korayar. The Pinnakoyal yard was fenced with barbed wire this year.

138. *Pit manure.*—A sum of Rs. 14–8–0 was realized by the sale of pit manure in the Muthupet yard against Rs. 1–11–0 last year.

139. *Reward to staff.*—The petty yard officer and a peon of Tranquebar yard co-operated with the Salt Factory Officer at Tranquebar in the detection of a case of smuggling of dutiable goods. Hence a reward of four annas each to the petty yard officer and the peon was given by the Customs department.

140. (iv) West Coast.—There were 50 yards at the beginning of the year. The Government sanctioned the re-opening of the Kodumbi fish-curing yard in G.O. No. 2290, Development, dated 15th December 1936, which was opened on 9th May 1937. Of the public fish-curing yards ten were in charge of Sub-Inspectors and the rest in charge of petty yard officers.

141. *Yards closed or newly opened.*—In G.O. Ms. No. 545, Development, dated 6th March 1937, the Government sanctioned the opening of a fish-curing yard at Moolky in the South Kanara district and the draft notification for acquisition of site has been approved by them. Since the close of the year the Government in G.O. No. 2095, Development, dated 15th September 1937, have sanctioned the employment of one petty yard officer and one peon for each of the two private yards to be opened at Kidiyoor and Malpe in South Kanara district.

142. *Review of the chief coastal fisheries.*—The oil-sardine (*Sardinella longiceps*) appeared in moderate quantities throughout the coast and were available from August to June while it appeared

last year from August to October and January to April. Though mackerel occurred throughout the year the catches were not satisfactory. Except in the Ponnani taluk, Cat fish were caught in fairly large quantities from July to November and January to June. Silver bellies, though they appeared throughout the year on the South Kanara coast, were absent in the months of December, January and February in North Malabar. Ribbon fish shoaled from July to December and from February to March and in May, but the quantity fished was not considerable. Soles were available from August to November and in May while prawns were caught in pretty large quantities throughout the Coast. " Nethel " (White bait) did not appear in some parts and were caught in small quantities in other parts. " Thalayan " (Ribbon fish) appeared for only one day, viz., 25th February 1937, at Gangoli, and " Chalmathi " (Sardine) also were scarce. " Chamban " (*Selar crumunophthalus*) also shoaled from September but the shoals were poor.

143. *Transactions*.—The total quantity of fresh fish brought to the yards was 1,124,674 maunds 29 seers and the quantity of salt issued was 181,773 maunds 16 seers, the corresponding figures for last year being 1,381,441 maunds 8 seers of fresh fish and 229,516 maunds 34 seers of salt. The weight of cured fish removed from all the yards amounted to 690,602 maunds 13 seers against 873,668 maunds last year.

144. All the yards in South Kanara district except Mangalore, Ullal, Manjeshwar, Kasaragode and Bekal showed a decrease in operations. The decrease was particularly marked in all yards north of Mangalore. The increase in the five yards mentioned above was due to good catches of Cat fish. Between Madai and Pudiappa, the yards showed a fall in the consumption of salt while the yards from Calicut southwards up to Chowghat showed an increase. Kadapuram yard showed a fall in operations resulting in a reduction in the consumption of salt by as much as 1,729 maunds 34 seers. Vadanapalli yard also showed a decrease of 1,397 maunds 22 seers.

145. *System of curing*.—Three systems of curing, viz., " Local ", " Colombo " and " Ratnagiri " were followed in the Kirimanjeshwar, Hungarcutta, Malpe I and Malpe II yards and two methods " Local " and " Ratnagiri " in the Padu-Thonse and " Local " and " Colombo " in the Udayavar yard. For the Ratnagiri system of curing a shed has been constructed at Gangoli but as it was done at the end of the season, operations could not be conducted in it. The rest of the yards adopted the ordinary method of local curing.

146. The total quantity of salt consumed under the " Ratnagiri " system of curing amounted to 3,413 maunds 24 seers and by the " Colombo " system, 5,694 maunds 2 seers as against 4,147 maunds and 15,840 maunds respectively in the previous year. This was due to poor catches of mackerel. In several yards the curers are taking advantage of the permission to remove fish in a semi-moist condition.

147. *Demonstration curing shed.*—Twenty thousand mackerel were purchased on 6th November 1936 and cured in the demonstration shed at the Malpe yard. The cost of fish, salt and labour, etc., amounted to Rs. 31–14–0. The cured fish was sold for Rs. 32–8–0. At the demonstration curing shed in the Calicut North yard, 2,000 mackerel were cured at a cost of Rs. 4–15–0 and sold for Rs. 5–4–0. As the ruling prices of cured mackerel were very poor, the majority of the curers had very small profits.

148. *Standard curing sheds.*—Ten type-design sheds were constructed and the tickets of nine type-design sheds were cancelled during the year in the South Kanara district. The total number of type-design sheds in use in the South Kanara district was therefore 315 against 314 in the previous year. Eleven type-design sheds were constructed in Malabar yards raising the total number for Malabar to 284. But for the prevailing trade depression there would have been an appreciable increase in the number of improved sheds.

149. *Pit manure.*—The sale-proceeds of brine manure collected in pits outside the Malpe I yard amounted to Rs. 75.

150. *Damage to yards.*—Proposals for shifting the Hungarcutta yard to another site were submitted to Government but they were not approved on account of the heavy expenditure involved—vide G.O. Ms. No. 133, Development, dated 16th January 1937. The Government ordered that an endeavour should be made to secure a cheaper site if the curers undertake to repay the cost. Alternative proposals are now under consideration. Danger from sea erosion in respect of the Mangalore and Bockapatnam yards continues. In G.O. No. 1533, Development, dated 5th September 1936, the Government sanctioned a loan of Rs. 380 to 9 curers of the Cannanore fish-curing yard for repairing their sheds damaged by cyclone last year. Towards the close of the year the Government sanctioned in G.O. No. 1567, Development, dated 13th July 1937, the reconstruction of the combined office, guard and store-shed in the Cannanore fish-curing yard at a cost of Rs. 3,400.

151. *Supply of salt.*—The total quantity of salt supplied from Tuticorin was 188,007 maunds 30 seers including 7 maunds 30 seers found in excess by weighment, against 239,902 maunds 18 seers last year. There was no depletion of salt in any of the yards during the year under report.

152. *Supply of salt to other departments.*—Thirty-four maunds of salt were supplied to the Sub-Jail, Mangalore, from Mangalore yard during the year. Three hundred and twenty maunds of salt from the Cannanore yard were supplied to the Central Jail, Cannanore. One hundred maunds of salt from the Calicut North yard were supplied to the Mental Hospital, Calicut, 2 maunds to the Fisheries Training Institute, Calicut, and 36 maunds to the Sub-Jail, Calicut. The Tanur Experimental station was supplied duty free with 20 maunds of salt from the Tanur North yard. The Kerala Soap Institute has ceased to indent for salt from this department.

153. *Wastage of salt.*—A total wastage of 664 maunds 32 seers occurred during the year against 437 maunds 27 seers during 1935–36. The unloading contractor on the West Coast has been held responsible for a wastage of 14 maunds 1 seer and the Tuticorin schooner contractor for a wastage of 16 maunds. Six hundred and fourteen maunds 30 seers was lost at sea owing to an accident to the schooner " Saderia " which carried 5,000 maunds of salt in January 1937. A wastage of 6 maunds 5 seers was written off during the year and 628 maunds 26 seers after the close of the year, which included the salt lost at sea.

154. *Balance stock of salt.*—The balance of salt in the fish-curing yards on the West Coast on 30th June 1937 was 155,158 maunds 5 seers against 150,100 maunds 23 seers last year.

155. *Establishment of a salt factory on the West Coast.*—A preliminary investigation of the possibility of opening a salt factory on the West Coast was made in September 1936 by the Inspector of Fisheries, Tuticorin, and a salt kangani. A site near the Payyannur and Elimalai railway station was selected tentatively and it was decided to start experiments by taking it on lease. As the ownership of the site is under dispute it is proposed to acquire it under the Land Acquisition Act.

156. *A new register.*—The new register for recording observations on certain kinds of fish introduced two years ago continues to be maintained in all fish-curing yards. Clear and detailed instructions for filling it up have been issued and it has been called " The Register of observations on shoaling fish."

(b) Private Oil and Guano Factories.

157. Forty-three factories worked in South Kanara during the year which was satisfactory when compared with the previous year. Oil-sardine were not in sufficient abundance to enable more factories to be opened for work. Seventeen tons of oil and 118 tons of guano were manufactured. The price of fish oil ranged from Rs. 120 to Rs. 180 per ton, guano from Rs. 25 to Rs. 55 per ton and beach-dried manure from Rs. 16 to Rs. 64 per ton.

158. In Malabar 60 factories worked producing 432 tons of oil and 2,117 tons of guano. The quantity of beach-dried manure produced was only 94 tons. The price for oil ranged from Rs. 100 to Rs. 175 per ton and for guano from Rs. 30 to Rs. 75. For beach-dried manure the price varied between Rs. 20 and Rs. 30.

II. MINOR MARINE AND ESTUARINE FISHERIES.

A. Prawns.

159. The Research on prawns in the Collair lake was continued and further data were collected. The fishing season was very poor this year also.

160. A site near the Village Munsif's house at Kottada was selected for building the proposed drier after the Tanur model for curing prawns in inclement weather, but its level requires raising. To help in framing rules, etc., for running the drier on a co-operative basis, a visit to tobacco-curing stations at Guntur was made on 24th April 1937 by the Inspector of Fisheries, Vizagapatam, in the company of the Agricultural Demonstrator.

B. Edible Oysters.

161. (i) OYSTER RESEARCH.—As in the previous year Pulicat Oyster Farm dried up and a heavy loss of newly grown oysters occurred after the closing of the two bars, which were kept open only from second week of November to the middle of March 1937. The few living oysters that were left in the beds after closing of the bar were shifted to the west of Goonukuppam village and to the north of the existing Lighthouse Park, where there was some water.

162. There was spat fall during the period when the bars were working. The oysters transferred from Ennur in 1935–36 (paragraph 146 of last year's report) have naturally helped in rehabilitating the depleted oyster beds.

163. (ii) OYSTER SUPPLY.—The 1936 season closed on 31st October and the 1937 season commenced on 12th March. Seventy thousand nine hundred and ninety-six oysters from Gokulapalli beds were sold to the public during the year against 104,350 oysters last year, and the sale proceeds amounted to Rs. 1,450–7–0 against Rs. 2,044–9–0 last year. The decrease in the number of oysters sold was partly due to the late commencement of the season. The expenditure during the year was Rs. 1,541–5–10 while it was Rs. 1,854–8–4 last year.

164. (iii) SHELL LEASES.—The right to collect dead Matti shells for a year in the Pulicat area was leased for Rs. 250.

III. INLAND FISHERIES.

165. There was little improvement over last year in conditions governing the inland fisheries of the Presidency. Stocking and cultural operations were therefore again conducted on a reduced scale. There were inadequate rains in some parts of the Presidency and consequently there was insufficient water in some of the provincialized tanks in the Chingleput and Nellore districts as last year. The economic condition of rural areas was very much the same and the fish rentals continued to be abnormally low.

A. Research.

166. (i) RESEARCH ON RURAL PISCICULTURE.—The scheme for opening a fresh water biological station at Madras still awaits allotment of funds by the Imperial Council of Agricultural Research.

167. (ii) DEEP-WATER TANK FISHING EXPERIMENTS.—The water level in the Mopad reservoir continued to be very low for want of sufficient rainfall. The catches, however, improved as a result of close attention paid to the fishing and fish-farming operations since my inspection of the farm in April 1936. The results of the fishing experiments during the year compare with those of the previous year as follows :

Year.	1936–37.	1935–36.
Total number of fish caught ..	8,940	5,918
Weight in pounds	11,298¾	10,103¼
Amount realized by sale of the fish	Rs. 862–9–8	Rs. 720–7–8
Total number of Catla caught..	1,845	2,011
Weight in pounds	4,371	5,087½

168. (iii) FISH BREEDING—*Avalanche hatchery for trout.*—The Avalanche hatchery was operated as usual by the Nilgiris Game Association.

169. At the instance of the Hon'ble Sir Charles Souter who wanted advice as to the best method of providing an adequate supply of live food for trout in the Mukerti lake for their growth, the District Forest Office, Nilgiris, was informed that a minnow (*Rasbora daniconius var nilgherriensis*) which is a vegetable feeder available in large numbers in the Ootacamund lake, might be caught and put into the Mukerti lake to serve as food for the trout. He was also told that the Inspector of Fisheries, Nilgiris, would render him all possible help for the above purpose. The Nilgiri Game Association appreciated this advice and the help promised and sanctioned a sum of Rs. 10 for the collection of minnows from the Ootacamund lake.

170. *Hilsa hatchery.*—The Hilsa hatchery experiments at Godavari were continued and for the first time the hatchery at Bobbarlanka was successfully operated in October 1936.

171. *Other Hilsa investigations.*—The investigation into the season, size and age of *Hilsa* occurring in the Cauvery, Kistna and Godavari rivers was continued during the year and resulted in securing direct evidence of the age and rate of growth of the fish. Young *Hilsa* not only reside in the lower reaches of rivers but frequently congregate from accident or inclination in tanks and ponds connected with the breeding reaches of such rivers. In the Bahur tank watered by the Ponnaiyar river, which is one of the South Indian rivers in which *Hilsa* breed, a large collection of young *Hilsa* measuring from 16·3 cm. to 22·5 cm. was obtained in May 1936

when the tank ran dry. As the tank runs dry annually direct evidence of the growth rate of *Hilsa* in the tank is available. Since the tank received its supply for the year between 24th August 1935 and 14th September 1935 there is conclusive evidence that the *Hilsa* fry bred in the Ponnaiyar river that summer had grown in the tank to sizes ranging from 16·3 cm. to 22·5 cm. The previous investigation in the Godavari also led to the inference that *hilsa* attains only about eight inches or so in the first year of its growth. The floods in the Ponnaiyar in 1936 were meagre and late (1st to 3rd October). When the tank was refished in April 1937 there was no evidence of young *Hilsa* showing that the 1936 season was unfavourable for *Hilsa* breeding in the Ponnaiyar. Evidently a complete failure of the spawning season occurs in years of late and inadequate floods. The investigation is proceeding.

172. *Gourami.*—The efforts of the Assistant Director of Fisheries (Inland) to breed *Gourami* in the Mopad fish farm having failed, an investigation into the causes was undertaken during my visit to Mopad in April 1936. The failure was found to be due to carelessness and lack of technical knowledge on the part of the staff. A local tank with permanent water which afforded facilities was selected for the *Gourami* breeders and a regular supply of water lilies, the favourite food of *Gourami* was arranged and effective shade screens with growing water plants were also provided under my personal supervision. By February 1937, the Assistant Inspector found the fish breeding. The fish has again bred in September 1937. It is to be noted that *Gourami* had not bred in either of the fish farms in the Nellore district, Ippur and Mopad, previously. It should now be possible to breed the fish for distribution in the Nellore district. The successful breeding of the fish has solved a long standing problem with reference to the stocking and improvement of Nellore waters. The favourable circumstances which has led to the successful issue of the experiment is under detailed study.

173. *Catla.*—The introduction of this fish into provincialized waters continue to be attended with marked success. In the Mopad reservoir the fish has thoroughly established itself and is available in fairly large numbers for sale to the public of the surrounding villages. In the Vellore Fort moat the lessee is reported to be realizing good profits by the sale of *Catla* grown in the moat as a demonstration to intending pisciculturists of the district. In the Cauvery no young *Catla* are reported to have been caught this year. Stocking the river should continue till the fish are thoroughly established.

174. *Chanos chanos.*—Until a *Chanos* pond is constructed on Krushadai island further research on *Chanos* farming has to be postponed. The *Chanos* fingerlings transferred to the private ponds at Mandapam are continuing to thrive but the growth in the muddy pond of Mr. Aboo Bucker Maraicar is distinctly less than that in a rocky pool belonging to the Mandapam Maraicar.

175. *Etroplus.*—This fish continues to breed in all the fish farms and a large stock of fingerlings was transferred to the provincialized water of the Presidency in the annual stocking operations.

176. *Mullets.*—A large stock of mullet fry obtained from estuaries was as usual utilized for stocking various tanks in the Nellore and Chingleput districts.

177. *Life history of Labeo fimbriata.*—*Labeo* with oozing eggs and milt were secured for the first time in the Mopad reservoir on 7th and 8th November 1936. The breeding season of *Labeo fimbriata* in the reservoir has been determined. This is one of the important local carp and forms the bulk (four-fifths) of the catch from the reservoir. The young are extensively employed by the department for stocking tanks and research on its life history has been awaiting the discovery of its breeding season in the lake. Steps can now be taken to initiate cultural studies on the life history, age and rate of growth of this important local carp for which Mopad offers rare opportunities.

B. Administration.

178. (i) FISH FARMS—*Sunkesula.*—Young crocodiles and otters entered the farm pond crossing the bund on the river bank and took a toll of about 30 fish. A loose stone wall along the foot of the flood bank bund was constructed during the year to prevent a recurrence of the trouble. Twenty-seven *Gourami* weighing 45¼ lb. were sold to the public for a sum of Rs. 11–5–0 during the year. The Pisci-cultural Assistant of the Bombay Industries Department visited the farm for studies and bought 300 *Gourami* fingerlings at the usual rate of Rs. 10 per dozen for experiments in Bombay.

179. *Præma fish farm.*—The ponds excavated in the area obtained from the Forest department failed to retain water as the soil was composed of large pebbles. A trial pit showed the existence of a bed of watertight white clay below the layer of surface pebbles. The ponds were therefore further deepened in April 1937 and have continued to retain water up to a depth of two feet ever since; there being sufficient sub-soil water in the locality. The cultivation of suitable weeds in the pond is receiving attention. The farm being built in a layer of clay of uniform consistency and being dependent on spring water of uniform quality offers a unique opportunity of testing the effects of different kinds of weeds on pisciculture. Opportunity will be taken to conduct these experiments at Præma.

180. Forty-one *Gourami* weighing 40 lb. were sold to the public for a sum of Rs. 10.

181. *Ippur fish farm.*—There was no shortage of water this year. The No. 3 pond in which the breeding of *Etroplus* for distribution to irrigation tanks had been suspended by the Assistant Director of Fisheries (Inland) since 1930 was revived and restocked with *Etroplus* which have bred satisfactorily. An abundant crop of young fry is now available for distribution to neighbouring tanks.

182. Owing to my absence on long leave no further progress was made with the two experimental ponds for *Gourami*. The successful breeding of the fish at Mopad during the year has indicated new lines of investigation at Ippur.

183. *Mopad*.—The most noteworthy feature of this year's work is the successful breeding of *Gourami* in the Mopad farm which has solved a long-standing difficulty—vide paragraph 172 supra.

184. At the instance of Government a detailed enquiry on the working of the Mopad scheme was undertaken and a report submitted to Government.

185. Mopad is the only new reservoir where the department stocks fish as well as conducts fishing. Thus a valuable record of the nature of the fisheries in the lake and the possibilities of cultural operations has been maintained since the formation of the lake in 1921. A remarkable change in the fisheries of the reservoir has been noticed in the course of these years. Several fish that were common when the reservoir was built have gradually disappeared and other species have taken their place. The most noteworthy change is the total disappearance of the ubiquitous murrel, the worst enemy of the pisciculturist in South India. An investigation into the causes for this change, including analysis of water and of the bottom deposits and a study of the fauna and flora is in progress and is expected to yield valuable data in regard to South Indian pisciculture, especially concerning the eradication of the predacious murrel from tanks.

186. The farm continues to provide a sufficient daily supply of fresh fish to the neighbouring markets at Kanigiri, Udayagiri, Kandukur and even Singarayakonda, one of the purposes for which the farm was established.

187. *Vellore fort moat fish farm*.—The anti-malarial operations as well as the growing and sale of *Catla* to the local markets as a demonstration to prospective fish culturists was continued on the usual lines. *Gourami* continues to breed in the farm satisfactorily.

188. Complaints were received in January 1937 from the Bar Association and the Commissioner of the Vellore Municipality that the water in the moat was emitting a bad smell. On inspection the smell was traced to the emptying of condemned ghee into the moat. This was removed by the Fisheries department. A recurrence of this nuisance can be stopped only by the co-operation of the local police staff residing within the Fort and the municipal sanitary staff with the local fishery staff.

189. The moat was stocked with 1,125 *Catla* fingerlings during the year and the fishery was leased out for an aggregate rental of Rs. 2,200 for two years ending 30th September 1938.

190. *Chingleput fort moat fish farm.*—The work of the Chingleput fort moat fish farm was seriously hampered by drought throughout the year. One of the sections which contained water was stocked with 367 *Catla* on 19th September 1936 and these had to be sold for Rs. 41 in March 1937 as the moat dried up.

191. *Powder factory fish farm.*—As the fish pond and buildings in the Powder factory had to be vacated the stock of *Gourami* was transferred from the Powder factory to a pond in the Madras Medical Stores Depot which was temporarily placed at the disposal of the department by the Medical Officer in charge (Lieut.-Col. E. H. Goss) and the stores, etc., were removed to the Superintendent's quarters at the Brickfields, Chetput.

192. The two ponds sanctioned by Government last year have been excavated at Chetput but they have not yet been handed over to this department.

193. (ii) GANJAM TANK STOCKING SCHEME.—As Government agreed in paragraph 2 of their memorandum No. 1372-I/37-1, dated 29th April 1937, to consider the tank stocking scheme for the portion of the Old Ganjam district still retained in the Madras Presidency, proposals have been called for from the Assistant Director of Fisheries (Inland).

194 (iii) METTUR PROJECT SCHEME.—The scheme for opening a fish farm at Mettur and for patrolling the reservoir was sanctioned by Government in G.O. Ms. No. 1629, Development, dated 21st September 1936. The immediate appointment of an Assistant Inspector and four watchers was also sanctioned for patrolling the reservoir. The patrol staff was appointed in January 1937. Four villages, two on the right side of the river and two on the left, were fixed as headquarters of the watchers who regularly patrol the margins of the reservoir, and their work is checked by the Assistant Inspector, Mettur, once a fortnight.

195. Four cases of poaching were detected during the year, of which two ended in convictions by the Sub-Magistrate of Pennagaram. Difficulty is experienced in launching cases against poachers as many of the village officers are afraid of them and hence do not come forward to render active assistance. At the instance of this department, however, they have been circularized by the Tahsildars concerned to help this department.

196. Poaching is largely facilitated by the coracles, which are used by the villagers on the margin of the lake ostensibly for fording. No effective patrol is possible without registering and licensing these coracles. A census of these is under preparation.

197. It is also reported that the local boards are selling the fisheries of inundated creeks along the margin of the reservoir and the Public Works Department that of the surplus channel, which

legitimately should be done by the Fisheries department. The matter is receiving attention.

198. The purchase of a motor boat and tender for patrolling the reservoir was also sanctioned under the scheme; as the coble belonging to the department was available, arrangements have been made to transfer it temporarily to Mettur.

199. Six fish ponds are under construction by the Public Works Department at Mettur and are expected to be completed in the course of the next few months.

200. (iv) PERIYAR SCHEME.—In pursuance of a request received from the Travancore Government proposals were submitted to Government in January 1937 for the protection and development of the Periyar Lake Fisheries and the establishment of a fish farm in the Suranganar reserved forest. The remote situation of the lake within a Native State and its peculiar physical features have hitherto rendered the prevention of poaching difficult if not impossible. The extensive waterspread of 10·21 square miles at flood water-level of the lake with its innumerable shallows and deep waters surrounded by a dense ever-green forest practically uninhabited and with its rank tropical vegetation providing an inexhaustible food supply as well as the comparative absence of natural enemies have all contributed to an abundance of fish in the lake. If the regular poachers, only four or five inhabitants of Kumili, who have the most intimate knowledge of the fishing possibilities of the lake are employed as fishermen and made to fish the lake regularly and systematically on behalf of the Government, all poaching, it is expected, could be automatically stopped. The proper exploitation of the lake will result not only in providing the funds needed for the protection and development of the fishery of the lake but also in the effective utilization of the fishery resources now lying waste as a source of much desired food supply. There is no other source of fresh fish for the surrounding country and the demand is considerable as evidenced by the high prices paid. Also the necessary concomitant of scientific protection and development is exploitation, failing which no useful purpose is served by the expenditure of time, money and effort in improving the fishery resources of the lake. Hence it was proposed that the mouths of rivers entering the lake should be guarded and simultaneously fished by approved methods for the protection of the fisheries of the lake. For the proper conservation and development of the lake fisheries, guarding against poaching alone is inadequate. Stocking with fry of suitable varieties of food fish and the introduction and acclimatization of exotic species are essential if the fisheries are to be developed and exploited to their maximum capacity. A level ground measuring 8·33 acres within the forest boundary of Suranganar reserve at the foot of the Cumbum-Kumili ghat road about 4 miles from Thekkady was selected as the most suitable site available for establishing the farm. The land is within British territory and is the property of Government. There will

thus be no cost of acquisition of site and any theft or trespass can be dealt with by the British Administration under the Madras Rules and Regulations. The site is commanded by an existing Public Works Department road channel. Even when the supply for irrigation is stopped in the off-season there is ample leakage water available for the road channel and for the fish farm. The fish raised in the farm will be used for stocking the lake as well as the Periyar-fed tanks of the Madura district by the regular annual introduction of the fry into both the lake and the irrigation channel. The proposal is now under the consideration of Government.

201. (v) PISCICULTURAL SURVEY.—Proposals for the establishment of *Catla* and Carp breeding ponds at Kambakkam could not be completed owing to my absence on long leave.

202. (vi) NILGIRI FISHERIES.—By an amendment to the Nilgiri Fishing Rules, the Government ordered the closure of the Kundah river below the junction of the Emerald valley and the Avalanche streams to all fishing except with fly from 1st January 1937 to 31st March 1937. The Government also prohibited the use of power boats on the Mukerti lake as the fishing might be spoilt by the noise and vibration and by the oil refuse from the boats. A report was submitted to Government on how far the prohibition of the use of explosives for catching fish has been effective. The use of explosives for catching fish in the Bhavani and Moyar rivers is reported to have been completely stopped and no cases have been reported since 1935.

203. (vii) PALNI HILLS TROUT FISHERIES.—The District Forest Officer, Madura, stated that in October 1933 fingerlings of Rainbow trout from Ootacamund were introduced into two streams on the Palni Hills, viz., the Konar stream and the Talavari stream, and that this stocking was so successful that it was considered desirable to issue fishing licences from June 1936. The Committee of the Palni Hills Game Association drafted the rules for control of fishing on the model of the Nilgiri fishing rules. At the instance of the Chief Conservator of Forests, the Secretary of the Association (District Forest Officer, Madura) consulted me and suitably revised the rules. He has also agreed to send me copies of annual reports of the Palni Hills Game Association and consult this department in the management of the fishing operations. The rules were published for general information and were finally issued in April 1937. The Government have permitted the credit in full of the trout fishing licence fees to the Palni Hills Game Association for a period of five years at the end of which period the position will be reviewed. Receipts derived from trout fishing licences are to be credited to the head "XXXII. c. Industries—Fisheries" and an equivalent grant paid to the Association at the end of each year by debit to "43. Industries—Fisheries—A. Direction—Other charges—Voted."

204. (viii) STOCKING OPERATIONS.—Stocking operations were conducted as usual this year. The following waters were stocked

with 4,459 *Catla* fingerlings at a cost of Rs. 660–2–6 against 7,180 *Catla* at a cost of Rs. 606–7–0 last year :—

(1) Cauvery above Mettur Dam	2,319
(2) Veeranam tank	600
(3) Vellore Fort-moat fish farm	1,125
(4) Chingleput do.	367
(5) Well at Arkonam (Rev. W. H. Hulbert) ..	25
(6) Well in Convent, Srivilliputtur	23
Total ..	4,459

The following gentlemen and institutions were also supplied with *Gourami*, *Catla* and *Etroplus* during the year :—

Names.	Number of fish supplied.		
	Catla.	Gourami.	Etroplus.
(1) The Executive Engineer, Chittaldrug, for stocking the Vani Vilas Sagara.	590	..	..
(2) Mr. A. K. Md. Shareef Marakayar, Madras, for stocking a pond in a mosque	50	..	..
(3) Dr. S. B. Setna, Fisheries Officer, Bombay	100	300	680
(4) Mrs. Buck, Saidapet	36	..	..
(5) Miss Chandler, Madura	25	..	..
(6) Professor M. Rahimullah of Osmania University	..	3	..
(7) Messrs. L. F. Foucar & Co., Madras ..	..	..	16
(8) The Panchayat Board, Ambattur ..	..	..	500

205. (ix) DELEGATION OF POWERS TO THE BOARD OF REVENUE.— In their order No. 1727, Development, dated 7th December 1935, the Government delegated to the Board the power to sanction the disposal of fishery rights in waters controlled by the department of Fisheries otherwise than by auction or tender subject to the condition that it should be exercised in consultation with the Fisheries department. In connexion with the proposal for the lease of the right of fishing in the Valamadugu and Paraval fisheries of the Veeranam tank in favour of the Lalpet and Udayargudi Fishermen Co-operative Societies for one year on a rental of Rs. 1,600 made on the recommendation of the Deputy Registrar of Co-operative Societies, Cuddalore, the Board of Revenue raised the question of the proper interpretation of G.O. No. 339, Development, dated 24th February 1928. The Board addressed Government recommending that " in cases where the sales are cancelled on account of fraud or collusion or combination the proper procedure should be to hold a

fresh auction with the offer of an individual or society if any as the upset price, unless for exceptional reasons, it is considered impossible or undesirable to do so ", and submitted for the approval of Government an amendment to B.S.O. No. 211. The Government issued orders amending the Board's Standing Orders to the effect that the fishery may be sold after an auction has been held, to the party recommended by the Fisheries department, if it is shown that a fresh auction is undesirable or impossible and that in suitable cases the Board may also allow the Fisheries department to conduct fishing with departmental staff.

206. (x) DISPOSAL OF FISHERIES BY PRIVATE TENDERS.—The following fisheries were disposed of otherwise than by auction :—

Name of water source.	Name of lessee.	Amount of rental.	Period of lease.	Compensation.
		RS.		RS.
1 Madurantakam tank.	Kuppu Nattan of Karunkuzhi.	1,600	Two years from 1st July 1936.	228
2 Perar Fisheries, Negapatam taluk.	V. Kumaraswami Nattar of Vallampadugai.	1,050	Do.	1,295
3 Cauvery river in Kollegal taluk —3 items.	Haralai Fishermen Co-operative Society.	70	One year from 1st April 1937.	..
4 New Coleroon river.	Vallampadugai Fishermen Co-operative Society.	1,500	One year from 1st July 1937.	2,795
5 Sriperumbudur tank.	Sriperumbudur Fishermen Co-operative Society.	35	One year from 1st January 1937.	23
6 Six items in Shiyali taluk.	Tirumalaivasal Fishermen Co-operative Society.	1,300	One year from 1st July 1936.	1,135
7 Two items in Lower Anicut system, Valamadugu and Paraval items of the Veeranam tank.	Udayargudi and Lalpet Fishermen Co-operative Society.	1,600	Do.	1,086

207. (xi) DISPOSAL OF FISHERIES ON TENDER SYSTEM.—The response to the call for tenders in the districts of Nellore and Chingleput was more encouraging than last year.

208. (xii) FISHERY SALES.—There was no improvement in fishery rentals this year. The total income during the year from inland fisheries was Rs. 69,738–1–4 against Rs. 69,739–2–2 last year. There has been a further fall in rentals in the Cauvery. The full extent of the effect of the Mettur Dam in the Cauvery fisheries could not still be gauged.

IV. CROWN MONOPOLIES (PEARL AND CHANK FISHERIES).

A. Research.

209. (i) CHANK-MARKING EXPERIMENTS.—Three hundred and seventy-five young chanks were marked and liberated during the year on the chank beds off Tuticorin in 8 to 10 fathoms against 511 last year.

Name of beds.	Depth.	Numbers of chanks marked and liberated.	Total number liberated in each bed.
Erru Ettu Par	$8\frac{1}{4}$ fms.	D. 941—D. 948	8
Velanguthundam	$8\frac{3}{4}$ „	D. 949—D. 965	17
Melonpathu	9 „	D. 966—D. 983	18
Melakelathi	$9\frac{3}{4}$ „	D. 984—D. 990	7
Kadayan Par	9 „	D. 991—E. 5	15
Vadaonpathu	8 „	E. 6—E. 18	13
Vaipar periapar	$8\frac{1}{2}$ „	E. 19—E. 39	21
Seltan Par	9 „	E. 40—E. 65	26
Neelankal pathu	10 „	E. 66—E. 100	35
Pulipundu	$8\frac{3}{4}$ „	E. 101—E. 135	35
Aluva Par	9 „	E. 136—E. 160	25
Kanava Par	$8\frac{1}{2}$ „	E. 161—E. 189	29
Pasi Par	$8\frac{1}{2}$ „	E. 190—E. 215	26
Kuthadiar Par	9 „	E. 216—E. 237 E. 266—E. 277	34
Athonbathu	9 „	E. 238—E. 265 E. 278—E. 290	41
Sayathombathu	9 „	E. 291—E. 315	25
		Total ..	375

The total number of young chanks thus liberated since the commencement of the experiment in 1931–32 is 2,464. Twenty-five marked chanks were recovered during the year against 16 last year, of which flesh from two shells had been extracted by the divers inadvertently and hence could not be returned alive to the sea for further growth. The total number so far recovered is 66. The migration and rate of growth of the shells refished this year is given in the appended statement—vide Appendix I.

210. From the statement it will be seen that chank D. 467 showed the maximum growth both in length and in diameter, viz., 18 mm. and 12 mm., respectively in 11 months and 22 days or 1·54 mm. and 1·03 mm. per month, respectively. The longest distance travelled by a shell was by chank No. D. 502 which had travelled 6 miles in 11 months and 22 days or 30 yards in a day.

211. (ii) Diving Experiments.—The high pressure air compressor and engine sanctioned by Government were purchased from Messrs. Volkart Brothers, Madras, at a cost of Rs. 2,415 in March 1937. When testing the compressor the connections to the air bottles were found leaky and had to be repaired. Messrs. Volkart Brothers have undertaken the repairs.

B. Administration.

212. (i) Inspection of Pearl Banks.—The Rameswaram, Karangadu and Thondi beds comprising the third or northern division of the Madras Pearl Banks last inspected in 1933–34 were inspected this year and were found to be barren of oysters. There was practically no change in the condition of the banks off Rameswaram and Thondi. As the Thondi beds offered facilities for dredging, there being no coral rocks, dredging operations were conducted there, but only star fish were obtained in shallower places (4 to 5 fathoms), while broken shell pieces were found in deeper places (5 to 5½ fathoms).

213. The Tholayiram par off Tuticorin was also inspected as usual, but here also only stray young oysters were found, though a larger number than last year was available.

214. The inspection was conducted on board "Lady Nicholson" from 23rd March 1937 and lasted until the 16th April 1937.

215. Thirteen oysters collected during the inspection were added to the stock of oysters at Krusadai Island.

216. (ii) Tinnevelly Chank Fishery.—398,782 chanks including 394 Idinthakarai chanks collected from fishing nets were fished during the year against 323,475 chanks in the previous year. One Valampuri chank, very rare in the gulf of Mannar, was secured on 4th March 1937 in Vaipar Periapar by an Arab diver (vide paragraph 225 below).

217. *Recruitment of divers.*—Six dhonies were registered for the fishery from Kilakarai and Periapatnam during the year against one dhoney last year. In all 64 Kilakarai divers, 48 Periapatnam divers, 15 divers from other parts of the Ramnad district, 5 Arabs, 1 Malabar diver, 6 local Muhammadan divers, 5 Valayars, 7 Pallars and 52 Bharata Christian divers from the Tinnevelly district participated in the fishery, making a total of 203 against 141 last year. The number of boats that participated during the year was 28 against 17 canoes and one dhoney last year.

218. *Advance to divers.*—An advance of Rs. 9 was outstanding with the divers at the beginning of the season. During the year a sum of Rs. 100 was issued as advance, and a sum of Rs. 100 was recovered, leaving the balance outstanding at the end of the year at Rs. 9 as last year.

219. *Boat loan to Sammatties.*—There was a balance of Rs. 86 due from Parathasi Fernando at the beginning of the year, of which Rs. 34 was recovered, leaving a balance of Rs. 51 at the end of the

year. He was ill during the best part of the season, and hence the loan could not be recovered from him in full. A sum of Rs. 50 each was issued as loan for the purchase of canoes to each of the Sammatties Madaswami Kudumban and Velu Kudumban of Tuticorin. The total loan outstanding with Sammatties, therefore, was Rs. 151 on 30th June 1937.

220. *Quarters for divers.*—Foreign divers were accommodated in the old Police lines as usual.

221. *Rate per chank.*—The rate per chank paid to divers remained at one anna per chank as last year.

222. *Fishing operations.*—The fishery was commenced on 6th November 1936 and closed on 25th May 1937. The number of days boats went out to sea was 145 against 122 days last year. Unfavourable weather prevented fishing on 29 days, and 22 days were Sundays or holidays when there was no fishing. The largest catch made by a single diver on any one day was 314 shells valued at Rs. 19–10–0 against 219 valued at Rs. 13–11–0 in the previous year. The average earning per day per head for the actual number of days of working and for the whole period of the fishery was Rs. 1–15–9 and Rs. 1–2–5 against Rs. 2 and Rs. 1–9–0 respectively last year.

223.—*Inspection of chank beds.*—Nineteen chank beds against 12 last year were buoyed for fishing. Their names and the number of chanks fished from each are given below :—

Name of bed.	Number of chanks fished.	Name of bed.	Number of chanks fished.
1 Pudupar	13,533	16 Vettia Kal ..	14,415
2 Tholayiram Par ..	3,511	17 Vypar Periyapar ..	4,473
3 Katti Thirukkai ..	19,049	18 Celtan Par ..	12,979
4 Vadai Thundam ..	21,373	19 Aluvapar	3,696
5 Kadayan Par ..	7,216	20 Kodumuthi ..	8,968
6 Melakelathi ..	87,340	21 Kadayan Par ..	7,582
7 Athonbathu ..	35,539	22 Koothadiar Par ..	12,462
8 Janathu Par ..	22,258	23 Kilavan Par ..	3,723
9 Erru Ettu ..	2,093	24 Other beds of Tuticorin.	16,574
10 Siluvai Par ..	7,066	25 Idinthakarai ..	394
11 Vadai Thundum ..	16,487		
12 Pasi Par	14,739	Total ..	3,98,782
13 Thundum ..	19,526		
14 Neelankal Pathu.	2,666		
15 Melonbathu ..	41,150		

224. *Immature shells.*—Out of 30,616 undersized chanks brought ashore by the divers inadvertently, 24,252 chanks were returned alive to sea; the rest could not be returned as their flesh had been removed by the divers. There were 90 undersized shells in those collected from fishing nets at Idinthakarai. The divers have again been warned not to extract flesh from immature chanks.

225. *Valampuri chank.*—The Valampuri chank fished during the year measured 4⅝″ in length and 7⅝″ in circumference and weighed 19 tolas. This has been valued approximately at Rs. 250 to Rs. 300.

226. *Idinthakarai chanks.*—Three hundred and ninety-four full-sized and 90 under-sized chanks were collected at Idinthakarai from fishing nets against 492 last year.

227. *Catches.*—Comparative statistics for the three years ending 1936–37 are given below :—

	1936–37.	1935–36.	1934–35.
Full sized	398,782	323,475	326,189
Under-sized	6,454	20,781	13,347
Wormed	58,526	45,081	68,892

A larger number than usual of under-sized shells fished inadvertently by divers were returned alive to the sea.

228. *Temperance.*—As usual tea and coffee were permitted to be sold to divers within the chank godown premises to prevent them from going to toddy shops. Kanji (rice water) was also sold on the premises.

229. *Sale of chanks.*—Messrs. K. T. M. T. M. Abdul Kayoom Sahib, Hussain Sahib, the contractors for the purchase of the three seasons' chanks (1933–34 to 1935–36) paid for and took delivery of the first two seasons' chanks and a portion of 1935–36 season's chanks on the due dates. For taking delivery of the balance 103,475 shells of 1935–36, they applied for an extension of time by two months which was granted by Government (G.O. No. 1311, Development, dated 11th June 1937). At the close of the year indications were not wanting to show that the chank market in Calcutta was improving in spite of the fact that the chank market had been cornered by one merchant. Since the close of the year the chanks for 1936–37 have been tendered for at Rs. 212–8–0 per 1,000 against Rs. 163–12–0 for the last three seasons.

230. (iii) RAMNAD DISTRICT CHANK FISHERIES.—The lessees of the Ramnad chank fishery are reported to have fished the following chanks during the year 1936–37 :—

	Full sized.	Under-sized and wormed.
Rameswaram Jadhi	250,000	60,000
Kilakarai and Periapatnam Jadhi.	7,000	1,500
Pillaimadam-Patti	70,000	15,000
Tirupalagudi-Patti and Mudirampatnam.	250,000	50,000
Total ..	577,000	126,500

Valampuri chank—3 (from Tirupalagudi).

More than a fifth of the catch consists of under-sized shells which shows that the lessee is systematically overfishing the grounds.

231. (iv) OTHER CHANK FISHERIES.—The Tanjore, South Arcot, Chingleput and Nellore District Chank Fisheries leased out to Mr. K. T. M. T. M. Abdul Kayoom Sahib of Kilakarai for a period of three years from 1st July 1935 fetched the annual rentals of Rs. 750, Rs. 225 and Rs. 125 respectively on the due date.

V. BIOLOGICAL SPECIMEN SUPPLY.

232. Five universities, 21 colleges and 12 other institutions all over India and Mr. Herrman of Australia were supplied with biological materials from the station. Among those who ordered supplies for the first time were Islamia College, Andheri (Bombay), Islamia College, Peshawar; and Durbar High School, Jodhpur. Complete sets of museum specimens intended for the study of animal life in secondary schools were supplied to the Madras Medical College and the Rayapuram Stanley Medical School, while a portion of the set was supplied to the Anglo-Sanskrit High School, Rasti (United Province). The Osmania University Zoology department were supplied with a good collection of specimens for their museum. The value of specimens supplied amounted to Rs. 2,364–10–0 against Rs. 3,215 last year.

233. No collection tour was undertaken by the Research Assistant during the year.

234. In his letter to Government No. H.A./3-8, dated 29th May 1936, the Accountant-General pointed out that the expenditure of the Zoological Supply Section, Ennur, exceeded its receipts and suggested that the question of keeping the expenditure within the receipts might be examined by Government. Government called for a report and this was submitted on 31st August 1936, wherein it was pointed out that the work of the section does not comprise merely the collection and sale of specimens, but it serves as an essential educational institution and should not therefore be judged by the immediate monetary returns it brings. The Government, in G.O. Ms. No. 132, Development, dated 16th January 1937, accepted this view and ordered the department, without sacrificing the efficiency of the services now done, to endeavour to keep the charges as low as possible.

235. *Oyster shell-grit.*—Four thousand three hundred and five pounds of shell grit were manufactured and sold to the chief poultry breeders all over India for Rs. 218–14–0 against Rs. 185 last year.

VI. ANTI-MALARIAL WORK.

236. The stock of larvicides in the Chingleput and Vellore fort-moats were maintained to check the breeding of mosquitos and the spread of malarial infection.

237. The annual anti-malarial operations on the Nallamalais were conducted during the year and 80 water holes were stocked with 31,000 larvicides at a cost of Rs. 99–11–6.

238. In Adderley Estate in the Nilgiris one of the reservoirs in which mosquitoes were discovered to be breeding was stocked with larvicidal fishes, *Barilius* sp. and *Danio*.

239. The Agent of Chittivalsa Jute Mills (Vizagapatam) was supplied by the Inspector of Fisheries, Vizagapatam, with 3,000 larvicides to stock a reservoir belonging to the mills.

240. The total cost of anti-malarial operations conducted during the year was Rs. 81-2-6.

VII. SOCIO-ECONOMIC WORK.

A. Education.

241. (i) WEST COAST—(*a*) *Fisheries Training Institute, Calicut.*—The institute re-opened after vacation on the 2nd of July 1936 and closed on 30th April 1937.

242. *Students.*—Four stipendiary Tamil students selected for fisheries training by the Superintendent, Diocesan Schools, Tuticorin, and six private Malayalee students from Travancore underwent training in the institute during the year. The students were taught in two classes partly because of the difference in their vernacular (the stipendiary students were Tamilians and the private students Malayalees) and partly because of the difference in the general educational attainments of the two sets of students (the Tamil students were III Form or VIII Standard grade, while the Malayalee students were S.S.L.C. holders or Intermediates). All the four stipendiary students passed the final examination held in the last week of April 1937. The six private students also qualified for the special certificate issued by the institute for such students.

243. *Work at the institute.*—The institute was inspected by the Assistant Director of Fisheries (Coast) and by the Personal Assistant to the District Educational Officer. As usual practical training in fishing, navigation and seamanship was given to the students for about seven months in the year. Practical work in canning, curing and the manufacture of fish-oil, fish-guano and fish-meal was done in the institute. The lessons in Zoology and Navigation were taught by the Research Assistant, West Hill, and the Inspector of Fisheries, Tuticorin, respectively. The Research Assistant, Tanur, visited the institute regularly for conducting classes in Fisheries technics.

244. The students went on excursions to Malpe in the South Kanara district and to the Fisheries Experimental Station, Tanur. The 'Sutherland' was used from November to February for lessons in Navigation and Seamanship. The piscicultural pond in the institute was remodelled. The *Catla* introduced into the pond continued to grow satisfactorily. The new boiler purchased last year was fitted up in the oil and guano shed. The library and museum have been enlarged. The school co-operative society continued to work satisfactorily. All the students of the institute were inmates of the hostel.

245. *Visitors.*—The Hon'ble Mr. M. C. Rajah, the Minister for Development, visited the institute on 29th June 1937 before the institute had started work for the term and ordered the institute to be closed as a measure of economy.

246. The chief plank in the department's socio-economic programme was the education of fishermen. No real progress in co-operation, temperance, hygiene or the general outlook and enlightenment of fishermen is conceivable apart from a well-planned system of elementary education suited to the environment of the fisher child. Moreover one of the chief obstacles to progress in the industry is the ignorant prejudice and innate conservatism of fishermen. The only hope lies in weaning the fisher children when still young and impressionable from the thraldom of traditional methods and age-old ideas by means of education including progressive ideas on fisheries. The Fisheries Training Institute has been the chief means of imparting this special education. The remarkable change that has taken place in the social habits and outlook of the fisher classes which has been remarked upon by more than one observer is largely attributable to the educational efforts of the department. The Committee on Fisheries, which made a thorough investigation into the aims and achievements of the department in 1928, says—

> "We have also the conviction that the efforts of the department in this direction have borne admirable fruit in the past."

That the work of the Fisheries Training Institute was appreciated by the people for whom it was intended is evident from the applications for schools that are received and from the offer of Rs. 10,000 from the fishermen of Tuticorin in order that a similar institute might be opened for them. In the circumstances, the closure of the institute is greatly to be regretted; the department has been deprived of its chief instrument for education and through education for the development of both the fishermen and the fishing industry.

247. (*b*) *Village schools.*—The number of schools at the beginning of the year including the model school attached to the Fisheries Training Institute and the Vellayil night school was 38. But on 2nd July 1936 the Vellayil night school was closed and no new schools having been opened the number of the schools at the end of the year was 37.

248. *Strength.*—The number of children on the rolls increased from 4,437 to 4,541. Of these 3,649 were fisher children and 892 from other communities. The number of girls at the beginning of the year was 1,514 and at the end of the year 1,578.

249. The schools in the Ponnani taluk are the best. The number on the rolls in the area has increased from 1,819 to 1,912, the increase in the number of girls being 53. The necessity for employing more women teachers in Fisheries schools is being stressed by inspecting officers. It is now an accepted principle

that women teachers are essential for girls and small children. As there are men teachers who have already commenced probation, Government consider that more women teachers cannot be appointed. The appointment of a conductress increased the daily attendance of girls in the Valiangode school. During the year a conductress for Kaipamangalam school was sanctioned and it is proposed to appoint conductresses for Palapatti, Mannalamkunnu and Naduvattam schools.

250. Kavvayi and Kannankadavu schools show very poor strength. At Kavvayi the strength is only 41 with four classes and two teachers. The village is small with only 18 huts and there is no scope for improving the strength, though there is no lack of enthusiasm among the fishermen at Kavvayi to educate their children. Kannankadavu has a strength of 50 distributed in 5 classes with 2 teachers. The third teacher's post recently sanctioned has been kept in abeyance owing to low strength. In class V the strength is only two and both are habitual absentees. This class was therefore closed. The Parapanangadi school, which is a Mappilla school, has improved considerably due to the efforts of the new headmaster and it became necessary to appoint two temporary additional teachers since the close of the year.

251. *New schools.*—No new schools were opened. Proposals to open new schools at Kasarakodi in Shirur for the Dalji Muhammadan fishermen and to take over the district board schools at Kanhangad, Hosdrug, Bekal and Adakathbail, and the private school started by Mr. M. K. Basappa at Moolky, are still under the consideration of Government. The proposal relating to the last school had to be modified into an application for a new school as Mr. Basappa was unable to carry on the school for want of funds and closed it.

252. Proposals for opening a new school at Pudu Ponnani have not yet been sanctioned by Government. Proposals for opening new schools at Pallipuram and Vekkode are still pending a joint inspection by the local Fisheries and Educational officers, the latter not having found time to do the inspection.

253. (ii) EAST COAST.—Five students from the Tinnevelly district were trained during the year at Calicut and they have all been reappointed as teachers in schools in the Tinnevelly district. The parish priests have expressed their great satisfaction at the training given to these teachers at the Fisheries Training Institute, Calicut.

254. (iii) MARINE AQUARIUM.—The number of visitors increased from 114,124 last year to 114,474 this year. The record attendance was as usual on Kannu Pongal day when 3,164 people visited the Aquarium against 3,342 last year. There were 2,241 visitors on the Vaikunta Ekadasi day against 1,339 last year.

255. The daily average attendance was 313·75 against 311·75 last year. Sixty-nine batches of school children numbering 3,417 visited the Aquarium against 50 in the previous year, totalling 2,475 children.

256. The following were the distinguished visitors to the Aquarium during the year :—

Sir C. Terrel, Chief Justice of Patna.
Sir James Grigg, Finance Member of the Government of India.
Sir John and Lady Russel.
Dr. Wright and Miss Wright of Scotland.

257. *Receipts*.—The gate collections amounted to Rs. 9,329–14–6 against Rs. 9,087–14–6 last year. The sale of guide books, picture post cards and miscellaneous receipts amounted to Rs. 170–3–0. A sum of Rs. 2,015 was realized during the year as rentals from the lessee of the Aquarium stall. Thus the total receipts amounted to Rs. 11,515–1–6 against Rs. 11,958–7–0 last year. The total expenditure was Rs. 6,716–7–2 against Rs. 6,162–6–6 in the previous year. The net receipt was therefore Rs. 4,798–10–4 against Rs. 5,796–0–6 last year.

258. The following gentlemen were permitted to take photographs of the fishes in the Aquarium :—

(1) A. Annaji Rao of Madras.
(2) Mr. Moorthy Vasan of Mylapore.
(3) Dr. B. K. Dass of the Osmania University who took a cinematograph film of the Aquarium tanks.

259. *Improvements*.—A new Allweiller pump No. 8 was installed for the overhead tank, as the one already in use was worn out. The turnstile and meter were repaired by the Public Works Department.

260. *Aquarium buildings*.—The revised estimate for a new Aquarium including a new overhead tank and provision against sand accretion, the chief defect in the old building, amounting to Rs. 70,000 was sanctioned by Government in G.O. No. 1309, Public Works, dated 7th July 1937. The sanction, however, was withdrawn in Public Works Department Memorandum No. 3444-C/37-1, dated 2nd August 1937, and the heads of departments were instructed to renew submission of the proposals that were considered urgent as Part II Schemes for 1938–39. The scheme has accordingly been submitted to Government as a Part II scheme as the old building is rapidly deteriorating.

B. Co-operative Societies.

261. (i) West Coast.—There were at the beginning of the year fourteen societies in the South Kanara district. A thrift credit society which was organized on 11th March 1936 at Kirimanjeshwar in the Coondapoor taluk was registered and started to function on 23rd February 1937 with eleven members. No other society was organized during the year and the registration of no society was cancelled. Hence there were fifteen societies at the end of the year with a paid-up share capital of Rs. 13,062–2–0. Of these societies 5 are for Mukkuvas, 2 for Bovis, 2 for Kharvis and 6 for Tulu speaking Mogers. The Kharvi societies are purely thrift societies.

262. *Members and paid share capital.*—At the beginning of the year the number of members in all the societies was 690. During the year 35 members were admitted and 23 members were removed. Rupees 226 was collected during the year towards share capital as against Rs. 235–8–0 in 1935–36. Rupees 503–11–0 were repaid as against Rs. 439–7–0 in the previous year. Hence at the end of the year there were 702 members with the paid-up share capital of Rs. 13,062–2–0 as against 670 members with a paid-up share capital of Rs. 13,340–5–0 at the beginning of the year. The reduction in share capital is due to the adjustment of share capital of defaulters to their loans.

263. Owing to a poor fishing season the instalments of share capital overdue could not be collected in spite of attempts made to collect them by the Special Inspector and the panchayat.

264. *Loans and Deposits.*—The fixed deposit of Rs. 15 held by the Uchil Bovis Co-operative Society at the beginning of the year remained undrawn together with another fixed deposit of Rs. 72–8–0 received during the year by the society. In the Coondapoor Kharvis Co-operative Society there were anna-fund deposits of members amounting to Rs. 26–7–0 at the beginning of the year. Rupees 1–12–0 was collected during the year towards the same and Rs. 3 were returned. No other society was successful in getting local deposits of members or non-members.

265. *Central Bank Loans.*—The following six societies, viz., Kanhangad fishermen, Bekal fishermen, Kottikulam fishermen, Kizhur fishermen, Kasaragod fishermen and Uchil Bovis Co-operative Societies have been depending on the Central Bank, Mangalore, for their finance. Rupees 8,983–6–0 was outstanding against all the societies at the beginning of the year in respect of borrowings and deposits. During the year Rs. 1,984–4–0 was borrowed and Rs. 2,447–8–0 repaid. Hence at end of the year Rs. 8,520–2–0 was outstanding against the societies of which Rs. 5,581 was overdue. The following societies have paid the interest dues fully :—

Kanhangad fishermen.
Bekal fishermen.
Uchil Bovis.

The following societies could not remit the interest noted against each :—

	RS.	A.	P.
Kasaragod fishermen	157	12	0
Kizhur fishermen	83	14	0
Kottikulam fishermen	11	12	8
Total ..	253	6	8

As in the previous year the Uchil Bovis Co-operative Society was not in default to the Central Bank or to the depositors either in respect of principal or in respect of interest. The society has been

allowed a cash credit loan also by the Central Bank. This facility is given only to societies which are regular in their repayments of dues.

266. The loans outstanding against the societies were those issued about a dozen years ago. Owing to unfavourable seasons since that time the societies were not able to discharge their liabilities to the Central Bank. With the assistance of the departmental Inspectors and the Special Co-operative Inspectors the societies were making some payments every year. From January 1937 to June 1937 there were no catches. In 1935–36 the Bekal Fishermen Co-operative Society borrowed a mortgage loan of Rs. 1,000 from the Central Bank to be advanced to one of its members on the mortgage of immovable properties for a term of ten years. The repayments towards this loan are being made regularly by the borrower to the society.

267. *Loans to members.*—The total amount of loans outstanding against members in all the 15 societies at the beginning of the year was Rs. 34,687–2–0. During the year Rs. 6,447–2–0 was collected from the members and Rs. 5,819 was issued as loans as against Rs. 13,431–9–0 and Rs. 15,338–15–0 collected and issued respectively in the preceding year. Hence Rs. 34,059 was outstanding against the members at the close of the year. Of this amount, Rs. 17,374 (a little above 50%) was overdue, as against Rs. 18,263–7–0 in the preceding year. A good number of loans have been secured during the year with better securities fixing repayments according to the repaying capacity of borrowers. But for the poor catches the members in all the societies would have been regular in their repayments.

268. INVESTMENTS—(*a*) *Reserve Fund.*—The total reserve fund of all the societies was Rs. 8,916–9–0 as against Rs. 8,340–15–0 in the previous year. Of this amount Rs. 3,293–7–8 has been invested in the Central Bank as against Rs. 3,144–7–0 in the previous year. Rupees 5,623–2–0 are pending investment at the end of the year, as the societies find it difficult to pay off the arrears now in a lump sum.

(*b*) *Shares in Central Bank.*—Of the 15 societies, 9 are affiliated to the Central Bank. The Aila Bovis, Hejmadi Mogers, Kaipunjal Mogers, Udayavar Mogers, Coondapoor Mogers, Coondapoor Karvis and Kirimanjeswar Fishermen Co-operative societies are those which are not affiliated. They do not borrow from the Central Bank. The total investment in shares at the end of the year was Rs. 395.

(*c*) *Savings Bank Deposits.*—Eight societies have opened savings bank accounts. At the end of the year the amount to the credit of the societies was Rs. 773–13–0 as against Rs. 645–9–0 in the previous year.

The total investments under the three heads was Rs. 4,462–4–3. at the end of the year. Besides the investments enumerated above,

the Iddya Mogers Co-operative Society owns a compound and a house valued at Rs. 225 and the Kizhur Fishermen Society owns a school building valued at Rs. 534–11–0.

269. *By-laws.*—The following societies have received new en bloc amended by-laws registered to suit their present requirements and conditions :

The Bekal Fishermen,

The Kottikulam Fishermen, and

The Kasaragod Fishermen.

The by-laws provide for the granting of loans on the pledge of raw or cured fish and on the mortgage of immovable property. The Bekal Fishermen Co-operative Society alone has availed itself of the benefit so far.

The other provisions in the by-laws which go to help the fisher-folk are—

(i) Issue of temporary loans not exceeding Rs. 20 by the President for the purpose of purchasing fish and salt to cure fish.

(ii) Granting of extensions.

(iii) Creation of building and dividend equalization funds. The other by-laws are on the non-agricultural limited liability model. All the 15 societies are now managed by the panchayatdars. No society is managed by any agent.

270. *General.*—At the beginning of the fishing season in 1936–37 in the months of September, October and November, fishermen had good catches of sardine and other varieties of fish. But they fetched very low prices. In spite of the low price the members paid whatever they could to the societies at that time towards their dues.

271. In the Malabar district there are 35 societies with 1,491 members on an aggregate.

272. *Membership and share capital.*—The total paid-up share capital of the members in all these societies together amounted to Rs. 27,272–6–0 on 30th June 1937. A total sum of Rs. 507–4–0 was collected towards share capital and Rs. 613–12–0 refunded to the members during the year. The Engandiyur Dheevara Jana is a new society which started work during the year.

273. *Deposits and borrowings.*—There are no outside deposits in any of these societies except the Blangad Purchase and Sale Society which received a deposit of Rs. 150 from the President in the year. Of the 35 societies, only 10 societies are indebted to the Malabar District Co-operative Bank. A total sum of Rs. 4,069–1–0 was outstanding against the society by way of deposits and loans on 30th June 1936. No amount was borrowed from the bank during the year though a sum of Rs. 150 was received by the Blangad Purchase and Sale Society as deposit from its President during the year. One hundred and ninety-eight rupees and six annas was repaid by

the societies in the year under deposits and loans. The societies thus owed Rs. 4,020–11–0 to the bank and other creditors on 30th June 1937. The whole amount of bank loan is overdue.

274. *Loans to members.*—The total amount of loans outstanding against the members in all the societies together was Rs. 52,328–7–0 on 30th June 1936. Loans issued to the members in these societies during the year amounted to Rs. 6,719–8–0. The total repayments by the members towards principal came to Rs. 5,866–14–0. A sum of Rs. 53,181–1–0 is therefore outstanding against the members in all these societies together at the end of the year. Rs. 41,156–14–0 is overdue. Out of the loans issued in 1936–37 Rs. 4,207–8–0 was for liquidation of prior debts, Rs. 1,158 for industrial and Rs. 1,354 for other purposes.

275. INVESTMENTS—(*a*) *Reserve Fund.*—There is a total reserve fund of Rs. 20,097–6–0 in all the societies together. Of this, Rs. 4,002–13–0 has been separately invested in the District Bank. The balance of Rs. 16,094–9–0 is still pending investment.

276. (*b*) *Shares in the Bank.*—There is a total paid-up share capital of Rs. 1,450 in the Malabar District Co-operative Bank to the credit of all these societies together.

277. (*c*) *Savings Bank.*—Only 16 societies have operated on the Savings Bank account in the Post office. The amount of deposit in the Post office at the beginning of the year was Rs. 1,073–4–0, Rs. 1,226–1–0 was deposited in the Post office during the year and Rs. 1,759 withdrawn. A sum of Rs. 545–8–0 remained as deposit in the Post Office Savings Bank at the end of the year.

278. *By-laws.*—The Kuriyadi Arayajana Society and the Madapalli Fish-curers' Society received *en bloc* amendments registered to their by-laws during the year. The special provisions in the credit societies' by-laws newly registered are—

(i) Issue of temporary loans to members for the purchase of fish and salt to cure fish;
(ii) Issue of advances to members on the security of dried or raw fish;
(iii) Issue of long-term loans at 6¼ per cent interest on the security of immovable properties;
(iv) Grant of extensions to loans and issue of long-term loans;
(v) Creation of building and equalization funds out of profits; and
(vi) Payment of honoraria to secretaries or other office-bearers out of profit.

The Engandiyur Dheevara Jana Society effected an amendment to by-law 1 altering the name of the society.

279. *General.*—The Thalayi Fish-curers' Society continues to own curing sheds in the fish-curing yard and it also owns a store building. The total assets under this head are estimated at Rs. 834–2–0.

The curing sheds are free of rent to the members of the society. The store building brings an annual rental of Rs. 60. The condition of the Vallayil Kadapuram Society is very bad. This is a one man's society and the president is all in all. Though an influential man among the fishermen, he is too busy with his own private affairs. The rest of the office-bearers are not in touch with the society. The collection of overdues has been neglected. Some loans have become time-barred. The bank dues have not been discharged. As the condition of the society was bad, an enquiry under section 38 of the Act was conducted and the officer who conducted the enquiry has recommended its liquidation. The Kadalundi, Chaliyam and Beypore Fishermen societies are doing some work and are showing signs of gradual improvement as a result of the interest evinced by some of the local fisheries school teachers. The Engandiyur Dheevara Jana Society which started work on 16th September 1936 is displaying great enthusiasm. The members are making prompt payments and fresh loans are being issued to the members. The Chentrapini Arayajana Society is a good society working fairly well. Regular transactions take place in this society and the members are prompt in their payments. New loans are issued to deserving members. This society has no borrowings of any kind from outside but works on the paid-up share capital of its members. The Secretary of the society is a teacher in the Kaipamangalam Fisheries school and is reported to be taking interest in society matters. The condition of the Vadanapalli Arayajana, Kundazhiyur and the Blangad Fishermen Credit Societies is bad. Enquiries under section 39 of the Act have been conducted into their affairs.

280. The progress of collection of overdues in general cannot be considered as satisfactory. Poor collections are partly due to indifference and partly due to the general poverty of fishermen members as a result of poor catches and low prices. The fishermen are unable to make prompt payments and collection work has in consequence suffered. In some cases owing to the prevalence of factions among members smooth working has been rendered difficult. Wherever absolutely necessary coercive action against defaulters has been resorted to for collection of overdues. Wherever possible a new panchayat has been constituted.

281. *The West Coast Fisheries Subordinate Officers' Co-operative Society.*—A society for the benefit of the non-gazetted staff of the Fisheries department on the West Coast was registered during the year and started work in November 1936. The by-laws have since been amended to permit of inferior servants being appointed as members and a number of them have since joined. Each share is to the value of Rs. 25 payable in instalments. One hundred and forty-seven shares have been subscribed for and Rs. 1,053 collected in the shape of share capital. The entrance fee collected was Rs. 34–2–0 and a compulsory deposit of Rs. 291–12–0 has also been made by members. Twenty-six loan applications have been admitted and Rs. 1,275 issued in the shape of loans. Of this amount Rs. 162

has been recovered besides interest due, viz., Rs. 13–11–4. A share has been taken in the Malabar District Co-operative Bank with the object of obtaining a loan to meet demands of members for loans. The expenditure incurred by the society is as follows :—

	RS.	A.	P.
Forms and stationery	43	3	0
Postage	4	12	9
Miscellaneous expenditure	0	3	6

282. (ii) EAST COAST—*Co-operation among inland fishermen.*—On account of the continued drought in the inland districts, the financial condition of some of the societies became worse. But the societies in the Kurnool and Nellore districts are functioning. Only five fishermen societies were given lease of fishery leases for varying terms during the year against eight in the previous year.

283. *Co-operation among sea-fishermen.*—The Lawson's Bay Co-operative Society is meeting a real need and for the Gangavaram fishermen arrangements are in progress to start a similar co-operative society. Arrangements to open a co-operative society for the benefit of the Kandras at Edupur are being made. The attempt to organize a co-operative society for installing and working a drier at Akkividu for prawn-curing has not yet yielded any result, as the prawn fishery was a failure this year. Edupur, where the Pathitha Pavana Mission is doing social work and the Co-operative department has been requested to organize a society for the Kandras, has been suggested to the Chicacole Economic Sub-Committee as a suitable Rural Reconstruction Centre.

C. Other Socio-economic Work.

284. (i) WEST COAST.—The officers of the Department are as usual rendering all possible help to fishermen to ameliorate their condition. The drink evil has now diminished considerably among fishermen but want of thrift continues. They are ever ready to take loans and spend money indiscriminately.

285. All the organizations and institutions that were in existence to improve the socio-economic condition of the fishermen continued to do their work. Two new reading rooms were opened during the year, one at Azhicode and another at Badagara, through the exertions of the fish-curing yard staff. The Nicholson Reading Room started at Quilandy is reported to be working badly. The Sub-Inspector of the yard made several efforts to revive this reading room but the fishermen would not respond. Fresh efforts will again be made this year when the fishing season begins. Want of road facilities to Madai and Madapalli villages is keenly felt by the fishermen.

286. (ii) EAST COAST.—Fishermen merchants and ticket holders of Althada have sent petitions protesting against the demand of a licence fee of Rs. 5 by the District Board, Chicacole. On the orders of the President, District Economic Council, Vizagapatam, the various presidents of the sub-committees of the district were approached

with schemes for roads to and wells in various fishing villages. The Inspector of Fisheries, Vizagapatam, attended the meeting of the Economic Sub-Committee for Chicacole at Mandasa on 9th June 1937. The Government have ordered that the villagers should contribute one-third of the cost of such schemes, and the fishermen are generally too poor to make such a contribution.

287. Professor Abdul Salam of Ellore wanted the help of the department to organize an All-India Muslim Fishermen Association and All-India Fishermen Soldiers Association.

288. (iii) PROVISION OF MARKETING FACILITIES FOR CURERS.—The weekly collection of information regarding ruling prices of salt fish from important markets on the East Coast, such as Dowleshwaram, Kondithope, Paramakudi and Orathanad continue and reports are sent to Tanur for compilation.

VIII. PROPAGANDA.

A. Rural Pisciculture.

289. Mr. Desigar's pond at Valivalam referred to in paragraph 242 of last year's report was netted on 14th June, 25th July and 26th July 1937. The fingerlings which measured 2 to 3 inches when introduced in September 1935 had grown from 12 to 24 inches, the majority measuring 19 inches. It was clear that the pond was not cleared of predaceous fish before stocking with *Catla* as three large fresh-water shark (*Wallago*) were caught with the *Catla*. Enquiries also showed that Mr. Desigar had netted the pond on several occasions and removed large fish without permission from the Department. Out of 450 fingerlings introduced only 108 were therefore available and were sold for Rs. 44. Though Mr. Desigar is eager for another experiment it was decided not to stock the tank again free of cost.

290. *Enquiries received and advice given.*—At the request of the Rev. C. S. Balraj of the S.P.G. Adi-Dravida Orphanage (Kumbakonam), his tank was inspected and advice regarding stocking given.

The University Professor and head of the department of Zoology, Calcutta, was furnished with particulars regarding the food of fresh-water fishes and the available literature.

Advice on stocking and culture of fish in tanks was also given to:

(1) The Commissioner, Negapatam Municipality.

(2) Mr. G. F. F. Foulkes, Trustee, Fischer Estate, Madura.

(3) The Skinnerpuram Panchayat Board, West Godavari district.

(4) Mr. C. J. L. Stokes of Calcutta.

(5) The Fisheries Research Officer, Punjab.

(6) Mr. Sita R. Varma of Gorakhpur district.

(7) Mr. Noresh Chandra Choudhuri of Sylhet.

(8) Mr. H. F. Edwards, Kingfield Estate.

(9) Mr. C. P. Sayagaram Pillai of Kilpauk.

(10) The Private Secretary to His Excellency the Governor of Behar, Patna.

B. Exhibitions.

291. The Department participated in the following exhibitions :—

(1) The United Provinces Industrial and Agricultural Exhibition, Lucknow (11th November 1936 to 3rd January 1937).

(2) Sri Chitra Exhibition, Trivandrum (12th November to 1st December 1936).

(3) Valacheri Rural Exhibition (near Guindy) (20th December 1936).

(4) Katpadi Rural Development Centre Exhibition (12th to 13th March 1937).

(5) Swadeshi Agricultural and Industrial Exhibition, Tinnevelly (18th June to 2nd July 1937).

Specimens of food-fish, museum specimens, cases of molluscs and crustacea of educational value, shell grit for poultry and Tanur products were exhibited. Advertisements regarding shell grit and museum specimens, Tanur products, etc., were also inserted in the Agricultural Villagers Calendar for the year, as usual.

A gold medal certificate was awarded by the Sri Chitra Exhibition for the excellence of the exhibits.

IX. FISHERY LEGISLATION.

292. (i) Licences for Fixed Engines.—Seventy free licences were issued to fishermen for placing 237 submerged trees in the Palk Strait for catching fish.

293. (ii) Stake Net Fishing.—In their Memorandum No. 351-I/36-1, dated 21st April 1936, Government called for a report on the petition of the fishermen of the Korapuzha river in the Malabar district requesting Government to allow them free stake net fishing in the river and not to auction the fishery (vide paragraph 246 of last year's report); on investigation it was found that the general economic condition of these fishermen was anything but satisfactory and fishing in the Korapuzha river was their only means of livelihood. The issue of licences for stake nets as in certain other rivers in Malabar but on payment of a small fee of Rs. 3 per net was recommended to Government. Government in G.O. Ms. No. 1541, Development, dated 9th July 1937, however, ordered the continuance of the system of auctioning the right of fishing.

X. PUBLICATIONS.

294. (i) Fish Statistics.—The fish statistics for the years 1928–29 to 1930–31 are still in the press. The statistics for the years 1931–32 to 1933–34 have been compiled and are under scrutiny.

295. (ii) BULLETIN ON FISHING METHODS.—In G.O. Ms. No. 1724, Development, dated 3rd October 1936, the Government have sanctioned the publication of Mr. Hornell's report on the fishing methods of the Madras Presidency—Part II—Malabar Coast as a departmental bulletin. The draft report with charts and illustrations is now in the press.

296. (iii) BULLETIN ON PEARL FISHERIES.—No further progress was possible in drafting this bulletin chiefly on account of my absence on long leave.

297. (iv) BULLETIN ON MARKETABLE FISHES.—The collection and preliminary identification of food fishes in connexion with this bulletin was continued till I went on long leave on 23rd March 1937.

298. (v) TRAWLER'S REPORT.—The third report on the Trawler's survey of deep sea fishing of Madras is under preparation.

299. (vi) SARDINE REPORT.—A preliminary report on the sardine investigation conducted on the West Coast by the Assistant Biologist since his appointment in 1930 was prepared by the Assistant Biologist and is under scrutiny.

PART II.

FINANCE.

300. *Summary of financial results.*—The total revenue for the year amounted to Rs. 4,23,043 against Rs. 5,48,667 in the previous year. The decrease was mainly due to a reduction in the quantity of salt sold in the fish-curing yards due to a less favourable fishing season than last year and the non-disposal of the year's catch of chanks within the year under report. The fish-curing yards were responsible for a net excess of revenue over expenditure of Rs. 48,048 as against Rs. 97,153 last year. The chanks of 1936–37 were not sold before the end of the year and they have been taken credit for at production cost, hence this section shows an apparent debit balance of Rs. 16,606. Since the close of the year, however, an offer of Rs. 212–8–0 per 1,000 full-sized chanks as against Rs. 163–12–0 last year has been received and recommended to Government; this will convert the apparent deficit into a profit of Rs. 25,003. The aquarium brought in a net revenue of Rs. 4,799 against Rs. 5,795 in the previous year though the gate collections were actually larger than last year. The revenue from inland fisheries were almost the same as last year, the actual recipts during the year being Rs. 69,738 against Rs. 69,739 in the previous year.

301. The total expenditure of the department was Rs. 5,84,007 against Rs. 5,93,861 in 1935–36. The decrease was chiefly due to a smaller quantity of salt purchased and transported to the West Coast yards than in the year previous.

302. The statement showing the total expenditure and revenue of the department is appended to the report (Appendix II). The rest of the statements are submitted in manuscript.

PART III.

STAFF AND EQUIPMENT.

I. BIOLOGICAL.

A. Assistant Director (Marine Biology).

303. In G.O. Ms. No. 1471, Development, dated 2nd July 1937, Government were pleased to sanction the permanent retention of the Assistant Biologist now designated Assistant Director (Marine Biology) and his staff with effect from 1st October 1937 on a time-scale of pay.

In the absence of Dr. D. W. Devanesan, Dr. M. Ramaswami Nayudu continued to act as Assistant Biologist till 14th August 1936; from that date Dr. Devanesan assumed charge.

The headquarters of the Assistant Director (Marine Biology) was changed from West Hill to Madras with effect from 23rd December 1936.

B. Research Stations.

304. There was no change in the personnel of the research stations except for the transfers of the fieldmen of both the stations, West Hill and Krusadai Island.

Mr. Fraser, Laboratory Assistant in charge of the Aquarium, was on leave from 1st to 25th October 1936 when Mr. Rajaratnam, a Madras Service Commission candidate, acted for him.

II. TECHNOLOGICAL.

Tanur Experimental Station.

305. Mr. S. Varadarajan was in charge till 25th September 1936, when Mr. V. P. Anantanarayanan, B.SC. (Hons. in Bio-Chemistry), a candidate selected by the Madras Service Commission, joined the station as acting Research Assistant.

III. EDUCATIONAL.

306. (i) FISHERIES TRAINING INSTITUTE, CALICUT.—M.R.Ry. E. Raman Menon continued as Headmaster throughout the year. There was only one Assistant in the Institute, two posts of assistants having been kept in abeyance owing to the reduced number of classes. As all the stipendiary students were Tamilians, the Tamil Interpreter was retained in service till the close of the school year.

307. (ii) VILLAGE SCHOOLS.—The number of teachers employed in village schools at the beginning of the year was 143, and at the end of the year 148. Nineteen of them were of the secondary grade (17 trained at the Fisheries Training Institute). Of these, 10, though qualified to be appointed as secondary grade teachers are in

the higher elementary teachers' posts for want of vacancies. One hundred and fourteen are of the higher elementary grade of whom 12 are ordinary trained, 100 fisheries trained and two untrained. There were 15 lower elementary grade teachers, three ordinary trained, nine fisheries trained and the remaining three untrained.

Accommodation.—In the South Kanara district six schools are housed in permanent buildings rented by the department and two in permanent buildings belonging to Government. Three are housed in semi-permanent buildings owned by Government and the remaining two in permanent buildings constructed by fishermen associations with the help of grants from Government.

The Kavvayi and Madapalli schools in Malabar continued to be housed in rented buildings. At Madapalli, the owner has provided additional accommodation and the congestion has been removed to a very great extent. A building on the newly acquired site at Korapuzha was constructed in March 1937 for the local fisheries school. A well and a urinal were also provided for the school. A well and a urinal for the Naduvattam school and a urinal for the Kannankadavu school were also provided this year. The Kuriyadi school is in need of additional accommodation and a well. An additional plot of land adjacent to the school is available and steps are being taken to acquire it for this purpose. At Parappanangadi also additional accommodation is needed. Without acquiring an additional plot of land it is not possible to extend the present shed. The proposal to acquire the required plot is under consideration.

The Kadavanad school is housed in a temporary shed with low mud floor and is very damp during the monsoon. The site is private land. Proposals for acquiring the site and constructing a new building are under consideration. The Kaipamangalam and Mannalamkunnu schools require additional accommodation. Proposals for the extension of the buildings are being submitted to Government. Proposals for an extension to the Palapatty school have already been submitted to Government. The acquisition of the Kottakadapuram school building and site has been sanctioned by Government, but the site and building have not yet been taken over from the Revenue Department. Proposals for acquiring the Talikulam school building with its site was sanctioned by Government (G.O. Ms. No. 1632, Development, dated 21st July 1937) since the close of the year and acquisition proceedings are in progress. The strength of the Blangad school has increased and additional accommodation has to be found. Government have provided funds for acquiring the site. A well has been sunk for the use of the Kundazhiyur school. Proposals for sinking a well at Valiangode and Mannalamkunnu have been sanctioned during the year.

308. (iii) CO-OPERATIVE SOCIETIES.—Messrs. K. Sankara Menon and P. Kannan Nayar, Inspectors of Co-operative Societies, continued to be in charge of co-operative work throughout the year.

IV. NAUTICAL.

(i) "Lady Nicholson."

309. As usual, this vessel was employed for the inspection of pearl banks when the full complement of the crew was entertained. The power-driven capstan obtained from England was installed on board the vessel in March 1937. The vessel was docked for bottom cleaning, etc., and for the installation of the capstan in March 1937 at a cost of Rs. 1,285–7–6. Portions of the False keel were renewed wherever necessary.

(ii) "Sea Scout."

310. This boat along with "Leverett" was employed in routine pearl and chank fishery operations as usual.

(iii) "Leverett."

311. Her decking was renewed at a cost of Rs. 425–11–6.

(iv) "Pearl."

312. This motor boat was transferred to the Krusadai Biological Station on 5th October 1936.

313. (v) COBLE.—The boat was taken to Calicut by Mr. Ritchie, the Master Fisherman, on 26th November 1936. As no fishing experiments can be conducted owing to the illness and subsequent repatriation of the Master Fishermen, it is proposed to transfer her to Mettur temporarily for patrol duty.

V. ADMINISTRATIVE.

A. Director's Office.

314. I continued as Director of Fisheries till 23rd March 1937, when I went on long leave out of India for 6½ months. During my absence Dr. F. H. Gravely, Superintendent, Museum, was appointed temporary Director. M.R.Ry. C. R. Natesa Pillai continued to act as Personal Assistant throughout the year.

Inland Fisheries, Nilgiris.—Mr. E. K. Madhavan continued as Inspector, Nilgiris, till 15th June 1937, when he went on three months' leave on average pay. M.R.Ry. K. U. Nayar was posted to act in his place.

The construction of a masonry inspection shed at Sundapatti on the Bhavani was taken on hand and completed since the close of the year.

B. East Coast (Northern section).

315. Mr. S. T. Moses continued as Inspector of Fisheries, Vizagapatam, throughout the year. Since the close of the year, he has been appointed Director of Fisheries, Baroda State.

C. East Coast (Central section).

316. Mr. C. G. Chakrapani Ayyangar was Assistant Director (Inland) till 16th August 1936, when he went on four months' leave preparatory to retirement. Mr. Jayaram Nayudu, the Assistant Director (temporary), took charge as Assistant Director (Inland) on 4th September 1936.

Mr. K. U. Nayar was Inspector of Fisheries (Inland) till 6th April 1937. On his taking leave, Mr. S. Varadarajan was appointed Inspector of Fisheries (Inland) from 20th April 1937.

D. East Coast (Southern section).

317. M.R.Ry. M. Jayaram Nayudu Garu, acted as Assistant Director, Pearl and Chank Fisheries, till 24th August 1936, and Dr. Ramaswami Nayudu took charge from him on 25th August 1936 and continued till the end of the year.

Mr. A. Somayaji, the temporary Inspector of Fisheries, was on leave for one month in February 1937, when Mr. S. Varadarajan acted as Inspector.

Government in their Order Ms. No. 1968, Development, dated 4th November 1936, sanctioned the further retention of the post of Inspector of Fisheries (Pearl and Chank) from 1st April 1937.

E. West Coast.

318. M.R.Ry. U. Karunakara Menon Avargal was Assistant Director (Coast) throughout the year.

Messrs. K. Ambady and T. P. Bharatan were in charge of the Northern and Central sections, respectively, as Inspectors throughout the year. Mr. U. Nagappa, Inspector of Southern section was on leave for two months and six days from 16th April 1937 and Sub-Inspectors Messrs. A. M. Achuthan and K. Gopalan Nayar acted for him in succession.

Of the two Sub-Inspectors attached to the Assistant Director's (Coast) office, one was abolished during the year and in its place the post of a head clerk on Rs. 55—5/2—70 was sanctioned. The manager was on five months' leave from 5th January 1937 on account of illness.

The office of the Assistant Director (Coast) was shifted to a new rented building on 1st September 1936.

I have the honour to be,

Sir,

Your most obedient servant,

B. SUNDARA RAJ,
Director of Fisheries.

[Appendices

APPENDIX I.

Chank Marking Experiment.

(Vide paragraph 209.)

Serial number.	Numbers of shells recovered.	Date of liberation and recovery.					Beds.			Growth.				Rate of growth per month.		Remarks.
		Date of liberation.	Date of recovery.	Interval.			On which the shell was liberated.	From which recovered.	Distance travelled.	In length.		In diameter.		Length.	Diameter.	
				Y.	M.	D.			MILES.	When liberated. M.M.	When recovered. M.M.	When liberated. M.M.	When recovered. M.M.	M.M.	M.M	
1	D. 345	16th Apr. 1935 ..	12th Nov. 1936 ..	1	6	26	Kadayan par ..	Kadayan par ..	½	100	104	51	55	·21	·41	
2	D. 412	2nd May 1935 ..	19th Nov. 1936 ..	1	6	17	Janathan par ..	Pudupar ..	3	105	112	55	60	·34	·49	
3	D. 444	8th Jan. 1936 ..	3rd May 1937 ..	1	3	25	Athonbathu par.	Pasipar ..	2	107	119	50	62	·71	1·5	
4	D. 467	23rd Jan. 1936 ..	12th Jan. 1937 ..	0	11	20	Vadaikadayanpar.	Athonbathu ..	3½	100	118	54	66	1·54	1·90	
5	D. 502	27th Jan. 1936 ..	18th Jan. 1937 ..	0	11	22	Melakilathi ..	Melombathu ..	6	100	104	54	55	·35	·16	
6	D. 536	Do. ..	23rd Jan. 1937 ..	0	10	27	Do. ..	Melakilathi ..	1	104	114	53	58	·81	·79	
7	D. 542	Do. ..	24th Dec. 1936 ..	0	10	27	Do. ..	Do. ..	½	101	106	51	54	·45	·54	
8	D. 551	30th Jan. 1936 ..	27th Nov. 1936 ..	0	9	28	Siluvari par ..	Do. ..	2	115	125	56	64	·88	1.43	
9	D. 561	Do. ..	28th Dec. 1936 ..	0	10	28	Do. ..	Do. ..	3	109	116	55	56	·58	·17	
10	D. 565	Do. ..	27th Nov. 1936 ..	0	9	28	Do. ..	Do. ..	2	111	114	55	58	·27	·55	
11	D. 569	Do. ..	28th Nov. 1936 ..	0	9	29	Do. ..	Do. ..	2	97	107	54	59	1·03	·93	
12	D. 571	Do. ..	Do. ..	0	9	29	Do. ..	Do. ..	2	112	115	53	56	·27	·57	
13	D. 584	4th Feb. 1936 ..	19th Jan. 1937 ..	0	11	15	Melakilathi ..	Saithundam ..	3½	101	111	52	57	·86	·84	Not returned to sea as flesh was removed by the diver.
14	D. 592	Do. ..	30th Mar. 1937 ..	1	1	26	Do. ..	Pudupar ..	3	104	105	51	55	·07	·56	
15	D. 593	Do. ..	25th Jan. 1937 ..	0	11	21	Do. ..	Melakilathi ..	1	105	118	52	58	1·08	1·00	
16	D. 613	14th Feb. 1936 ..	20th Apr. 1937 ..	1	2	6	Athonbathu ..	Pudupar ..	2	103	113	53	62	·69	1·21	
17	D. 654	18th Mar. 1936.	Do. ..	1	1	2	Do. ..	Do. ..	2	100	101	51	53	·08	·30	
18	D. 738	21st Mar. 1936.	12th Jan. 1937 ..	0	9	22	Pudupar ..	Athonbathu ..	3	112	119	51	56	·66	1·03	
19	D. 759	Do.	30th Mar. 1937 ..	1	0	9	Do. ..	Pudupar ..	½	100	116	54	58	1·28	·59	
20	D. 762	Do.	Do. ..	1	0	9	Do. ..	Do. ..	½	106	110	51	52	·30	·16	
21	D. 772	25th Mar. 1936.	11th May 1937 ..	1	1	16	Melonbathu ..	Athonbathu ..	2½	109	110	52	57	·07	·71	Not returned to sea as flesh was removed by the diver.
22	D. 791	Do.	3rd Dec. 1936 ..	0	8	8	Do. ..	Vadaonbathu ..	2	106	112	54	58	0·67	0·87	
23	C. 837	16th Mar. 1934 ..	9th Dec. 1936 ..	2	8	23	Janathupar ..	Eruettu ..	2	96	105	50	54	0·28	0·24	
24	D. 855	30th Apr. 1936 ..	7th Apr. 1937 ..	0	11	8	Athonbathu ..	Kuthadian par.	3	98	103	54	56	0·44	0·32	
25	D. 887	Do. ..	3rd May 1937 ..	1	0	3	Do. ..	Pasi par ..	2	108	122	54	60	1·08	0·93	

N.B.—(1) In working out the interval the date of catch is omitted.

(2) In working out the rate of growth the number of days in the period of interval when it is less than ¼ of a month is ignored and when it is over ¼ and less than ¾ it is reckoned as ½ a month and more than ¾ as one month.

APPENDIX II.

Expenditure and Revenue of the Fisheries Department for the Fisheries year 1936–37.

Sections.	Expenditure.			Revenue.				Difference.		
	RS.	A.	P.	RS.	A.	P.		RS.	A.	P.
A. Direction	36,483	1	5	24	5	0	—	36,458	12	5
B. Pearl and Chank Fisheries.	61,918	14	10	45,312	14	7	—	16,606	0	3
C. 1. Fishing Experiments.	3,319	2	10	..			—	3,319	2	10
2. Assistant Director (Coast).	13,251	11	11	68	4	8	—	13,183	7	3
D. Tanur Station ..	9,870	2	8	4,708	15	2	—	5,161	3	6
E. Training Institute, Calicut.	9,857	12	9	238	6	9	—	9,619	6	0
F. Fisheries Schools ..	70,336	11	5	238	1	3	—	70,098	10	2
G. Assistant Director (Inland).	1,03,240	8	6	69,738	1	4	—	33,502	7	2
The Nilgiri Fisheries ..	11,867	2	0	7,989	8	9	—	3,877	9	3
H. Oyster Farm	1,541	5	10	1,700	7	0		159	1	2
J. 1. Marine Biological Section—										
Zoological Supply Section, Ennur.	6,261	10	10	2,683	0	3	—	3,578	10	7
Research Station, West Hill.	11,787	12	8	98	0	0	—	11,689	12	8
Research Station, Kurusadai Island.	7,031	9	5	156	14	0	—	6,874	11	5
J. 2. Aquarium	6,716	7	2	11,515	1	6		4,798	10	4
K. Fish-curing yards ..	2,30,523	3	0	2,78,571	3	11		48,048	0	11
	5,84,007	5	3	4,23,043	4	2	—	1,60,964	1	1

Government of Madras

DEVELOPMENT DEPARTMENT

G.O. No. 202, 24th January 1938

Fisheries—Administration Report—1936-37—Review.

Order—No. 202, Development, dated 24th January 1938.

Recorded.

2. Researches on oil sardine and mackerel were continued at the Biological Station at Calicut and many useful data have been gathered in regard to the spawning season and the problems concerning the age, size, rate of growth, food or stomach contents and condition of gonads and fat of the sardine. The breeding grounds and eggs and larvæ of the mackerel were discovered for the first time. Experiments in rearing pearl oysters at the Biological Station at Krusadai during the last nine years (1928–37) have established the practicability of maintaining the Indian pearl oyster in parks and of breeding and growing the spat to adult size. This was one of the primary objects with which the station was started. This initial aim having been attained, the two main objects of the station, viz., (1) enlarging the stock of oysters in the park so as to provide spat for re-populating the adjoining pearl banks when the natural supply fails and (2) inducing cultural pearls in the Indian pearl oyster for commercial purposes as in Japan remain to be undertaken. Experiments in deep sea fishing which were to have been started during the year by Master Fisherman Mr. Ritchie who had been specially recruited for the purpose could not be commenced as Mr. Ritchie soon after arrival fell so seriously ill that he had to be repatriated. When as is hoped the experiments are revived shortly these two Biological stations will serve as useful bases for operations out in the sea.

3. The Acquarium intended as a place of public resort where wonders of colour and form characteristic of the fauna and flora of the tropical Indian seas are exhibited, continues to be popular. A proposal is now under consideration for the construction of a new building for this very useful and interesting institution. The Pulicat Oyster Farm is increasing in popularity in the matter of supply of oysters guaranteed as free from sewage pollution as also the Biological Specimen Supply section at Ennore which is the only place from where colleges in India draw their supply of Indian organisms for study. The operations in the fish-curing yards showed a slackening owing to unfavourable fishing season. Out of the 51 yards on the West Coast and 53 yards on the East Coast, four of the latter were transferred to Orissa on 1st April 1936.

4. The Inland Fisheries again registered a fall in income from rentals of tank and river fisheries, for the fourth time in succession during the past 15 years, mainly, it is believed, due to the construction of the Mettur Dam. Experiments are now in contemplation to exploit the Mettur Reservoir with a view to make up the loss in the revenue as far as possible. Stocking operations in these waters could be done during the year only on a reduced scale owing to inadequate rains and insufficient water in some of the tanks. Deep water fishing experiments in the Mopad Reservoir yielded better results. Definite evidence was obtained as to the age and rate of growth of Hilsa. Gourami has now bred in the reservoir while Catla has established itself. Catla contributed to good profits in the Vellore Fort Moat farm also, but there is as yet no direct evidence that it has established itself in the Cauvery.

5. The number of children of the fishermen community under instruction in the schools run by the department is on the increase. The question as to whether these schools should be continued under the department or transferred to the district boards concerned is now under consideration.

6. The net cost of the department was nearly Rs. 1,61,000, all sections excepting the Acquarium, the fish-curing yards and on a small scale the oyster farm having worked at a loss. But if the money spent on the education of the fisher children is excluded as it should be, the net cost is only approximately Rs. 91,000 out of which over a third represents the loss from Inland Fisheries mainly brought about by the construction of the Mettur Dam. The loss from the Pearl and Chank Fishery section (Rs. 16,600) is only apparent as the chanks collected during the year were sold only after the close of the year. The balance is a legitimate expenditure on scientific work and research carried on by the department.

(By order of His Excellency the Governor)

C. J. PAUL,
Secretary to Government.

To the Director of Fisheries.
,, the Local Administration Department.
,, all Collectors.
,, the Board of Revenue.
,, the Collector, Salt Revenue.
,, the Commissioner of Labour.
,, the Chief Engineer for Irrigation.
,, the Registrar of Co-operative Societies.
,, the Director of Agriculture.
,, the Director of Industries.
,, the Accountant-General.
,, the Education and Public Health Department.
,, the Public Department.
,, the Finance Department.
,, the Director-General of Commercial Intelligence and Statistics (with C.L.).
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